West Virginia Methanol, Inc.

March 15, 2021

Mr. Joe Kessler, PE
Engineer
West Virginia Division of Air Quality
601-57th St., SE
Charleston, WV 25304

Delivered Via E-mail

RE: Transmittal of Revision 1 of the Pleasants County Methanol Plant Application for Construction Permit

Dear Mr. Kessler,

Please find the attached Resubmittal R1 (Revision 1) of the WVM Pleasants County Methanol Plant Air Permit Application. This resubmittal addresses WVDAQ comments and information requests made after the initial submittal. The summary of notable changes are as follows:

1. Page 4, Section 1.0, Methanol plant production capacity of the plant is 120 MMGPY, (985 MT/day; 359,496 MT/year) or 40 MMGPY (328.3 MT/day) per unit and various capacities have been updated thorough the document to reflect this basis.
2. Page 6, Section 2.2.2, add "HTCR stacks will utilize a continuous emissions monitoring system (CEMs) to measure and record CO and NOx."
3. Page 9, Section 2.3.2, add "A Predictive Emission Monitoring Systems (PEMS) will be used to track and record SMR flue gas and flare emissions based on event simulation data (shown in Attachment N – Detailed Calculations) and measured process parameters (e.g., pressure, temperatures, flow, etc.) as input variables."
4. Page 60, Attachment I updated to reflect revised methanol production quantity. Also, updated barge loading pump capacity to 1,500 gpm.
5. Page 62, Attachment J updated to reflect Attachment N revised values based on changes indicated on other list items.
6. Page 67, Attachment K, updated on equipment leaks based on changes indicated in Attachment N. Note fugitive CO emissions has been added.
7. Page 73-76, Updated to include maximum design heat input of the SMR main burner and duct burners for 1) normal operation when firing on purge gas and 2) when in SSM mode of operation and firing on natural gas. Addressed maximum and expected H2S values. Added CEMS and PEMS.
8. Page 85, item 1, revised to read The LP flare section is available to handle small equipment leaks (fugitive and between repair leaks). The calculations in Appendix N, page 156 now include fugitive and intermittent equipment leaks (between repairs).
9. Page 112 and 136, SMR Oxidation Catalyst DRE for VOC is conservatively set to 0 percent to take no VOC emissions reduction in oxidation catalyst.
10. Page 115, updated LP Gas to Flare from typically 0 flow and associated emissions to now accommodate fugitive emissions and intermittent equipment leaks {see Attachment N}

11. Page 117-119; dropped reference to Urea as the reagent. The reagent will be either anhydrous or aqueous ammonia. Updated SCR NOx DRE from 85 percent to 86 percent and the Formaldehyde DRE from 91 percent to 91.9 percent.
12. After Page 133, added Miratech's DREs estimate for various pollutants.
13. Page 136, Previous flow rates (and associated burner heat inputs) were increased by the 1.1 which is the ratio of the maximum design heat input divided by the process design heat input
14. Page 136-138, changed purge gas emission calculuation from no HAPs generated while on purge gas to include a maximum of 10 percent of PNG by heat content for trim gas and up to 1.0 percent moles of methanol in purge gas. The HAPs calculations associated with the natural gas follows AP-42 Table 1.4-3 emissions factors for speciated organic compounds from Natural Gas Combustion. The purge gas contains up to 1.0 percent moles of methanol which is a HAP. Boilers or Industrial Furnaces are required by EPA to have destruction and removal efficiency of 99.99 percent of this HAP.
15. Page 158, the notes on the table have updated to be more accurate and clear.
16. Page 160 and 161, Light liquid VOC emission factor changed from 0.000131 to 0.000165 per AP-42, Table 2-5. Sampling Connections changed from 0.015 to 0.0015 also per Table 2-5, open connections. On Gas VOC – contains CO, changed weighted average VOC gas value from 6 percent to 80 percent. Added CO fugitive emissions calculation. Calculated the leaks going to the LP Flare. PSV to atmosphere and sample connections were adjusted.

We appreciate your review and consideration of these changes.

Best Regards,

Lars W. Scott
Executive Vice President

cc: Jon Erickson, Global Imperium Group

APPLICATION FOR CONSTRUCTION PERMIT

PLEASANTS COUNTY METHANOL PLANT

APPLICANT

West Virginia Methanol, Inc

23 NOVEMBER 2020

Revision 1
15 MARCH 2021

PREPARED BY:

GIG Global Imperium Group

Table of Contents

1.0 INTRODUCTION

West Virginia Methanol, Inc., ("WVM") is proposing to construct the Pleasants County Methanol Plant (the "Plant"). The Plant is proposed to consist of 3, 328 metric ton per day methanol units and 7, 4MW reciprocating engines to generate electricity needed to operate the Plant. The Plant will be located in an unincorporated area of Pleasants County, WV, near Belmont, WV. The site formerly hosted the Cabot Carbon Black plant that was demolished in the 2008-2009 time frame.

WVM is applying for a construction permit under the West Virginia Code of State Regulations (CSR) at 45CSR13. The project will be a minor source of air emissions with respect to the U.S. Environmental Protection Agency's (USEPA) Prevention of Significant Deterioration (PSD) and USEPA's Title V Operating Permit program.

The purpose of this air permit application is to provide the technical information required by the WVDEP air permitting program, and demonstrate that the proposed facility will be in compliance with regulations related to ambient air quality. This document includes:

- Section 2.0 Project Description
- Section 3.0 Emissions Inventory
- Section 4.0 Regulatory Review
- Application for Construction Permit WVM Pleasants County Methanol Plant.

2.0 PROJECT DESCRIPTION

2.1 Site Location

The proposed site for the Pleasants County Methanol Plant is located in an unincorporated area of Pleasants County. The site was formerly a part of the Cabot Carbon Black Plant. The site address will be 9764 South Pleasants Highway, St. Marys, WV 26170. It is approximately 9 miles West of St. Marys on State Route 2. The site boundaries include the Ohio River to the northwest and State Highway 2 along the southeast side. A CSXT rail corridor runs through the site parallel to the river.

2.2 Summary of Proposed Facility

The proposed plant will utilize three MeOH-To-Go™ units, each with a production capacity of 40 MMGPY (328 metric tons per day) of International Methanol Producers & Consumers Association (IMPCA) and Grade AA specification methanol derived from pipeline-grade natural gas supplies sourced from the region. For permitting purposes, the availability of each unit is assumed to be 8,760 hours per year, resulting in an operating capacity of the combined three MeOH-To-Go™ units of 120 MMGPY (359,500 metric tons per year).

Each MeOH-To-Go™ unit ("Unit" or "Units") will be comprised of the following equipment:

- Pre-Reformer section
- One Steam Methane Reformer (SMR) consisting of a Haldor Topsoe Convection Reformer (HTCR) system (natural gas and off-gas fired), including a waste heat recovery boiler with supplemental duct firing. The HTCR is equipped with selective catalytic reduction (SCR) for control of nitrogen oxides (NO_X) and an oxidation catalyst for Carbon Monoxide (CO) emissions control;
- One methanol synthesis section and off-gas recovery to the HTCR fuel system;
- One methanol distillation system and off-gas recovery system to the HTCR fuel system.

The methanol plant storage and loading system will consist of:

- Nine API 620 methanol storage tanks with vent return to the process.
- Two truck loading racks with two loading spots, equipped with closed dome loading and vapor balancing systems.
- Two rail loading spots, equipped with closed dome loading and vapor balancing systems.
- One barge loading spot, configured for closed dome loading with a vapor balancing system.

The methanol plant will be powered by natural gas fuel reciprocating internal combustion engines (RICE) which are referred to as the "Power Plant". The Power Plant will consist of seven nominal 4 MW RICE generators. While it is not anticipated that all seven RICE generators will operate at the same time, for the purposes of this air permit application it is assumed that they all will operate for 8,760 hours per year.

The Power Plant will be comprised of:

- Seven Spark Ignition (SI) Internal Combustion Engines (Caterpillar CG260-16 Engines)

- Seven Synchronous Generators (Marelli MJH 800 LA8 or similar) at medium voltage
- An SCR system for control of NOx emissions
- Oxidation catalyst for control of CO and volatile organic compounds (VOCs).

Attachment F provides a schematic process flow diagram of the Methanol Plant. The basis for the calculation of emissions from the various processes is provided in Section 3.

2.2.1 Pre-Reformer Section

Each methanol unit has a pre-reformer section that includes a desulfurization system, feed preheaters, a hydrogenator, and a pre-reformer vessel. The desulfurization system removes sulfur-containing compounds from the pipeline-grade natural gas feeding the pre-reformer. The pre-reformer section converts the higher hydrocarbons in the pipeline natural gas to methane, hydrogen, carbon monoxide, and carbon dioxide in preparation for SMR feed.

2.2.2 Steam Methane Reformer

The Steam Methane Reformer is a Haldor Topsoe Convection Reformer (HTCR) that utilizes convection heat transfer which minimizes surplus steam production and hence minimizes additional fuel firing. The HTCR-based synthesis gas (syngas) production allows for an efficient small-scale methanol plant that is balanced on steam production and steam consumption. The HTCR produces syngas from pipeline-grade natural gas and self-generated steam. The syngas production requires heat which is primarily supplied by the combustion of hydrogen-rich process purge gases and supplemented with the combustion of pipeline natural gas as needed. The HTCR consists of:

- A single burner in a furnace where heat for the reforming reaction is generated,
- A multi-tube reforming reactor where syngas is produced by the reaction of pre-reformed natural gas and steam over a catalyst, and
- A flue gas waste heat boiler section with supplemental firing (duct firing) where heat from the reforming section is recovered and fuel is combusted to supply additional heat for the production of steam.

Combustion emissions from the HTCR burner and duct burners will be exhausted to an SCR unit for NO_X emissions control and an oxidation catalyst for CO emissions control. Good combustion practices and the use of low-sulfur gaseous fuels will minimize emissions of other combustion pollutants. The HTCR reactor, which normally operates under high pressure, is not vented to atmosphere under normal operating conditions. HTCR stacks will utilize a continuous emission monitoring system (CEMS) to monitor and record NOx and CO.

2.2.3 Methanol Synthesis Section

The methanol synthesis section consists of a series of heat exchangers, knock-out drums and catalytic reactors that convert the syngas to a crude methanol liquid stream comprised of approximately 80 percent methanol and 20 percent water. The methanol synthesis system includes off-gas recovery from the knock-out drums and a hydrogen-rich, sulfur free off gas stream which are both directed to the HTCR burner and duct burners, where these purge gases serve as the primary fuel. The methanol synthesis section, which normally operates under high pressure, is not vented to atmosphere under normal operating conditions.

For facility startups and for emergency purposes, the reactor system is connected to the process flare header which is routed to the high pressure flare section for control of emissions.

2.2.4 Methanol Distillation System

The methanol distillation system consists of a series of distillation and refining columns that purify the crude methanol to IMPCA-specification methanol and purify the byproduct water to where it can be recycled in the process.

The methanol distillation system is not vented to atmosphere. Any off-gases from methanol distillation are recovered and used in the fuel system for the HTCR. For plant upsets, the distillation system is tied to the process flare header which is routed to the high-pressure flare section for control of emissions.

2.2.5 Methanol Storage

Methanol storage will be comprised of the following:

- Eight 375,000 gallon, stainless steel API 620 methanol product storage tanks, (total of 9 days of storage). The tanks will be 40-foot diameter by 40-foot high. The methanol storage tanks are designed to operate under pressure, with a nitrogen pad, and will vent back to the process;

- One 375,000 gallon, stainless steel API 620 off-spec tank, 40-foot diameter by 40-foot high. The off-spec tank is designed to operate under pressure, with a nitrogen pad, and will vent back to the process. Contents of the off-spec tank are sent back to the process for reprocessing.

All above ground storage tanks will comply with the applicable requirements contained in the 2015 amendments to the Aboveground Storage Tank and Public Water Supply Protection Acts of the state of West Virginia and associated issued guidance from the WVDEP.

2.2.6 Methanol Loadout

Methanol loadout for will be comprised of the following:

- 2-400 gallon per minute (gpm) loading racks for filling trucks in dedicated methanol service; and
- 2-400 gallon per minute (gpm) loading racks for filling railcars in dedicated methanol service.
- 2-1500 gallon per minute (gpm) barge loading pumps will support barge loading operations.

Vapor balancing between the transportation equipment (trucks, railcars, and barges) and the storage tanks will be used to eliminate the release of VOC emissions during loading operations.

2.2.7 Flare

Each Methanol Unit is equipped with an elevated flare located adjacent to the HTCR stack. The flare is a dual flare with a High Pressure (HP) flare section and a Low Pressure (LP) flare section. There is a natural gas fueled pilot that serves the HP and LP sections. The HP flare section is utilized during startup, shutdown, and maintenance (SSM) events and is sometimes referred to as the SSM flare. The LP flare section is available to handle small equipment leaks (fugitive and intermittent in need of repair of those leaks).

2.2.8 Reciprocating Engine Generators

The reciprocating engine generators are not connected to the utility grid and therefore they can supply power to meet the methanol units' power load requirements. WVM is planning to construct a 28 MW power plant consisting of seven, 4 MW reciprocating engine-driven generators to supply electricity. Most of the time, the Plant will operate with 5 or 6 engines operating. The other engine will either be in reserve or undergoing planned/unplanned maintenance. Each engine requires routine maintenance for oil changes and replacement of wearable components.

Each engine's exhaust will be equipped with a SCR system to reduce and control NOx emissions. There will also be an oxidation catalyst to reduce and control VOC, CO, and Hazard Air Pollutants (HAP).

The engine generators only take a few minutes to go from no load to full load during a startup. The SCR/Oxidation catalyst heat up times are only a few minutes to be fully functional. For the purposes of this air permit application the potential to emit calculation is based on all seven engines operating at full load for 8760 hours per year. This approach is conservative as the calculated emissions are greater than the emissions associated with 5 or 6 engines operating.

2.3 Methanol Unit Operations

Methanol unit operations consist of 1) normal operation and 2) Startup, Shutdown, or Maintenance (SSM) conditions as described below.

2.3.1 Normal Operation

During normal operations, natural gas is converted to methanol in the methanol unit. There are emissions from SMR flue gas stacks from firing on purge gas. There are also emissions from the flare pilots.

2.3.2 Startup, Shutdown, and Maintenance Operations

The SSM operations consist of four cases: cold startup, hot startup from an HTCR trip, methanol synthesis trip, and a total unit trip. The table below provides the duration and the number of occurrences per year for each methanol unit.

Case	Duration, hrs	Number of Occurrences, per Unit
Cold Startup	32.5	4
Hot startup from HTCR Trip	18.9	2
Methanol Synthesis Trip	15.3	2

Total Unit Trip	4	4

A Predictive Emission Monitoring Systems (PEMS) will be used to track and record SMR and flare emissions based on event simulation data (shown in Attachment N) and measured process parameters (e.g., pressure, temperatures, flow, etc.) as input variables. The operational sequence of each case is discussed below.

2.3.2.1 Cold Startup

There are various stages of a cold startup of a MeOH-To-Go™ unit that produce emissions including:

- Charging the Distillation Section with methanol and starting distillation operation in recirculation mode
- Firing of the Waste Heat Recovery Section with the duct burners to generate steam for heating the methanol Distillation Section and to provide steam to the SMR Section
- Heating of the various equipment in preparation for Syngas production
- Initial syngas production, prior to startup of the Methanol Synthesis Loop

2.3.2.2 HTCR Trip and Restart

When the HTCR is shutdown, there will be emissions as equipment is automatically vented to the Flare System. The HTCR burner firing and syngas production is stopped when the HTCR trips. In the Hot Restart scenario, steam flow is maintained to the HTCR. When the HTCR trips and syngas production stops, methanol production and purge gas production decrease to zero. During this time, purge gas and light gases from the Distillation Section are flared. When purge gas flow is stopped to the fuel header, fuel for the duct burner firing is automatically switched from purge gas to natural gas and the duct burner firing is increased to maintain steam production to allow continued operation of the Distillation Section in recycle mode.

During restart of Syngas production, the syngas from the HTCR is sent to the Flare System for combustion. Duct burners continue to operate on natural gas until the HTCR is fully fired-out.

2.3.2.3 Methanol Synthesis Loop Trip

When the Methanol Synthesis Loop (Methanol Synthesis section) trips, methanol production stops and the syngas must be flared to keep the SMR Section operating. Shutting down the SMR Section would result in more emissions. Purge gas is lost to the fuel gas header, so the fuel to the HTCR main burner and the duct burners is automatically switched to Natural Gas. Syngas production rates are ramped down to 50% (the minimum operating rate) to reduce natural gas consumption and emissions.

2.3.2.4 Total Unit Trip (purging emissions only)

When the complete Unit is tripped offline and is not to be restarted, it must be purged free of hydrocarbons (4 hours). The gases from the SMR and the Methanol Synthesis sections are purged to the Flare.

3.0 EMISSIONS INVENTORY

The projected emissions of the proposed Plant are calculated based upon data supplied by West Virginia Methanol's contractors and vendors, emission factors obtained from USEPA's AP-42 Compilation of Air Pollutant Emission Factors (AP-42), and other recognized standards. Attachment N provides the detailed emissions calculations.

The New Source Review (NSR) is a Clean Air Act (CAA) program that requires industrial facilities to install modern pollution control equipment when they are built. The Section 111 of the federal CAA requires the EPA to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants that are subject to the New Source Performance Standards (NSPS).

The six criteria pollutants are ozone (O_3), particulate matter (PM), carbon monoxide (CO), lead (Pb), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2). Volatile organic compounds (VOCs) and nitrogen oxides (NO_X) are ozone precursors, so they are included. PM is further classified by size. PM2.5 refers to all particles that have an aerodynamic diameter of less than 2.5 microns. PM10 refers to all particles that have an aerodynamic diameter of less than 10 microns. Another term is total suspended particulate (TSP) and refers to particles of all sizes. The 45 CSR 21 regulation on VOC for certain counties in WV do not apply for this project. VOC Subject to Reasonably Available Control Technology (RACT) is not applicable.

The CAA in Section 112(b) defines a list of Hazardous Air Pollutants (HAPs) and for the proposed project are subsets of the NSR PM and VOC pollutants. Technically, trace metals are part of PM and trace organics are part of VOCs. Methanol is classified as both a HAP and a VOC.

This section provides a summary of the annual emissions for compared to permitting thresholds, as well as the short-term emissions (durations of 24 hours or less). A summary of the emissions of regulated NSR pollutants and HAPs are provided. Emissions from point sources and fugitive sources are broken out separately. Point sources come from emission sources that are vented through a stack or vent. Fugitive sources come from emission sources that have no specific emission point.

3.1 Emissions Units

3.1.1 Pre-Reformer

Pre-Reformer does not have point source emissions, during non-normal operations venting is directed to a flare dedicated for control of releases during such SSM events (SSM Flare). Emissions from startups and process upsets are described below in the discussion of the SSM Flare.

3.1.2 Steam Methane Reformer

During normal operations the SMR is fueled by the process (purge) gases, high in hydrogen content, and combustion emissions from the HTCR for each unit are calculated based on the maximum hourly heat input of the unit and vendor-supplied emissions data. Under SSM scenarios (startup, shutdown, and trip conditions) when fueled by natural gas, the emissions (including HAPs) are calculated based on USEPA's AP-42 for natural gas-fired boilers. The HTCR will be equipped with SCR for NO_X emissions control and an oxidation catalyst for CO emissions control.

The calculated emissions during normal operation for the SMR flue gas stack for each unit and total for 3 units are included in Table 3-1. Detailed emissions calculations are presented in Attachment N.

Table 3-1. SMR Calculated Potential Emissions during Normal Operation

Process	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	SO_2 (tpy)	NO_X (tpy)	CO (tpy)	VOC (tpy)	HAP (tpy)
SMR Unit	4.41	4.41	0.61	13.27	8.08	4.41	0.50
SMR Plant	13.22	13.22	1.83	39.81	24.24	13.22	1.51

The calculated emissions during SSM events at the SMR flue gas stack emission point for each unit and total for 3 units are included in Table 3-2. Detailed emissions calculations are presented in Attachment N.

Table 3-2. SMR Calculated Potential Emissions for all SSM Events Per Unit and per Plant

Case	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	SO_2 (tpy)	NO_X (tpy)	CO (tpy)	VOC (tpy)	HAP (tpy)
Total Unit	0.075	0.075	0.001	0.15	0.15	0.16	0.02
Total Plant	0.22	0.22	0.004	0.45	0.45	0.49	0.06

3.1.3 Methanol Synthesis Section and Distillation System

The methanol synthesis systems and distillation and refining column systems do not have direct discharges to atmosphere during normal facility operations. Hydrogen-rich gases are recovered from these systems during normal operations and returned to the SMR (HTCR) as fuel. The calculated SMR combustion emissions include consideration of these off-gases.

For the purposes of evaluating worst-case SSM emissions, venting from these systems to the Flare was considered. Emissions from such a process upset are described below in the discussion of the Flare.

3.1.4 Methanol Storage and Loading

VOC emissions from the methanol storage tanks and off-spec tank are controlled by operating the tanks under pressure with a nitrogen pad and by vapor balancing. When the process is shutdown , the API 620 tanks are rated for a pressure so that they do not vent.

Methanol Product will be loaded into tank trucks at a rate of 400 gallons per minute (gpm) and into railcars at a rate of 400 gpm. Product will be loaded into barges at a rate of 1,500 gpm. One barge can be loaded at a time. Vapors displaced from the trucks, railcars, and barges will be routed back to the storage tanks (vapor balancing) to eliminate loadout emissions. The product loading system will be a closed-dome loading configuration, and the trucks, railcars, and barges are dedicated for methanol service.

As noted above, the methanol storage tanks and methanol loading utilize vapor balance systems. Excess vapors, if present are routed to SMR burners and offset any natural gas or purge gas emissions, therefore present no net emissions. This is listed in Attachment I as VB-O to represent the vapor balance system and the other to indicate the SMR.

3.1.5 Flare

The low pressure (LP) flare section handles small equipment leaks (fugitive and between repairs of those leaks) which cannot be tied into a pressurized flare header. Example sources are the reciprocating compressor crankcase, reciprocating compressor packing, compressor distance piece sweep, and process analyzer. The LP Flare tip will be located beside the HP Flare tip and will share the same pilot burners.

The calculated emissions during normal operation from the LP flare section for each unit and total for 3 units are included in Table 3-3. Detailed emissions calculations are presented in Attachment N. This calculation is based on emissions from all of the flare pilot burners operating 8760 hours per year. This is also referred to as Flare Normal emissions in Table 3-6.

Table 3-3. LP Flare Section Calculated Potential Emissions

Case	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	SO_2 (tpy)	NO_X (tpy)	CO (tpy)	VOC (tpy)	HAP (tpy)
Flare Normal Unit	0.003	0.003	0.001	0.0876	0.360	0.006	0.002
Flare Normal Plant	0.009	0.009	0.002	0.2626	.991	0.019	0.006

During startup, shutdown, and upset conditions, gas is sent to the process flare header which feeds the HP section of the flare (also referred to as the SSM Flare).

The calculated emissions during SSM events at the HP Flare section for each unit and total for 3 units are included in Table 3-4. Detailed emissions calculations are presented in Attachment N. This is also referred to as Flare SSM Event emissions in Table 3-6.

Table 3-4. HP Flare Section Calculated Potential Emissions during SSM Events Per Unit and Total Plant

Case	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	SO_2 (tpy)	NO_X (tpy)	CO (tpy)	VOC (tpy)	HAP (tpy)
Total Unit	0.314	0.314	0.001	1.19	9.12	0.16	0.106
Total Plant	0.94	0.94	0.002	3.57	27.35	0.48	0.32

3.1.6 Reciprocating Engines

Combustion emissions from the reciprocating internal combustion engines are provided based on the maximum RICE output from vendor-supplied emissions data. Emissions of HAPs are based on vendor supplied data as well as data from USEPA's AP-42 for natural gas-fired reciprocating, 4-stroke lean-burn engines. Each of the 7 reciprocating internal combustion engines (RICE) will have its own SCR for NO_X emissions control and an oxidation catalyst for CO, VOC, and HAPs emissions control.

The calculated emissions for the RICEs are included in Table 3-5. Detailed emissions calculations are presented in Appendix B.

Table 3-5. RICE Calculated Potential Emissions.

Process	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	SO_2 (tpy)	NO_X (tpy)	CO (tpy)	VOC (tpy)	HAP (tpy)
Unit RICE	0.50	0.50	0.087	6.98	5.51	4.57	2.25
Plant RICE	3.50	3.50	0.61	48.89	38.58	29.37	15.72

3.2 Fugitive Sources

Fugitive VOC emissions from equipment leaks were calculated in accordance with USEPA's "Protocol for Equipment Leak Emission Estimates" (USEPA, 1995d) using SOCMI emission factors. Pumps with magnetic drive or canned motor pumps and have no fugitive emissions so were not included in the fugitive emission inventory. Pumps with a more conventional design do have fugitive emissions and were included in the fugitive emission inventory. Component counts, including valves, flanges, and fittings were estimated from preliminary engineering drawings of the proposed facility. Total fugitive VOC emissions from equipment leaks were calculated to be 5.87 tpy for the plant. Some of the fugitive VOC emissions where associated with natural gas in the methanol process or power plant and consequently not all of the VOC emissions are comprised of methanol (HAP). HAP emissions were calculated to be 5.85 tpy for the plant. Detailed fugitive emissions calculations are presented in Attachment N. Fugitive equipment leaks will be minimized by implementation of a leak detection and repair (LDAR) monitoring program in accordance with New Source Performance Standard (NSPS) 40 CFR Part 60, Subpart VVa.

3.3 Summary of Calculated Potential Emissions

A summary of calculated potential emissions for the Plant is provided in Table 3-6. Table 3-7 provides a list of the top HAP constituents to be emitted from the plant. A more detailed summary of pollutant emissions is provided in Attachment J: Emission Points Data Summary Sheet and Attachment K: Fugitive Emissions Data Summary along with detailed emission calculations in Attachment N.

Table 3-6. Summary of the Calculated Potential Emissions for Pleasants County Methanol Plant

Potential Emissions for Pleasants County Methanol Plant Pollutants, tpy								
PROCESS	PM	PM10	PM2.5	SO2	NOx	CO	VOC	HAP
SMR Normal	13.22	13.22	13.22	1.8	39.8	24.2	13.2	1.5
SMR SSM Events	0.22	0.22	0.17	0.0	0.45	0.45	0.49	0.06
Flare SSM Events	0.94	0.94	0.71	0.0	3.57	27.35	0.48	0.32
Flare Normal	0.01	0.01	0.01	0.0	0.26	1.08	0.02	0.01
Power Plant	3.50	3.50	3.50	0.61	48.89	38.6	29.37	15.7
Subtotal Point Sources	**17.9**	**17.9**	**17.7**	**2.5**	**93.0**	**91.7**	**43.6**	**17.6**
Equipment Leaks	--	--	--	--	--	0.06	5.87	5.85
Haul Road	1.2	0.24	0.06	--	--	--	--	--
Subtotal Fugitive	**1.2**	**0.24**	**0.06**	**0**	**0**	**0.06**	**5.87**	**5.85**
Total Plant	**19.1**	**18.1**	**17.7**	**2.5**	**93.0**	**91.8**	**49.5**	**23.5**

Table 3.7. Top HAP Constituents Emitted from the Plant

HAP Constituent	TPY
Acetaldehyde	2.82
Acrolein	1.40
Formaldehyde	8.17
Methanol	8.09
n-Hexane	1.36
Naphthalene	0.08
Total	21.92

4.0 Regulatory Review

Clean Air Act permitting in West Virginia is the shared responsibility of the West Virginia Department of Environmental Protection and USEPA. The proposed facility is located in USEPA Region 3. Pleasants County is designated as attainment or unclassifiable for all criteria pollutants. The Pleasants County Methanol project is subject to the meet federal emissions performance standards under 40 CFR Part 60 New Source Performance Standards (NSPS). In addition, the plant must comply with the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Reciprocating Internal Combustion Engines (RICE) as outlined in the Code of Federal Regulations under 40 CFR 63 Subpart ZZZZ. Further the project must meet the state permitting requirements under the West Virginia Code of State Regulations (CSR). The project is considered a minor source under the Prevention of Significant Deterioration (PSD) and Title V Operating Permit programs. The following is a review of the regulatory requirements for this project.

4.1 Prevention of Significant Deterioration (40 CFR 52.21 and 45CSR14)

The PSD regulations stipulate that any major new stationary source within an air quality attainment area undergo PSD review and obtain applicable federal and state preconstruction air permits prior to the commencement of construction. PSD addresses eight criteria pollutants: SO2, NO2, PM, PM10, PM2.5, CO, VOC, and Pb. It also includes other NSR Regulated Pollutants. The PSD permitting requirements do not apply to HAPs.

The PSD regulations apply to any source type listed in any of 28 designated industrial source categories having potential emissions of 100 tpy or more of any pollutant regulated under the CAA. They also apply to any other source having potential emissions of 250 tpy or more of any pollutant regulated under the CAA.

The proposed plant will be in Pleasants County, which is designated as attainment or unclassifiable for all criteria pollutants. Sources with emissions of the attainment pollutants exceeding the PSD applicability thresholds noted above would be required to obtain a PSD permit prior to commencing construction.

The Pleasants County Methanol Plant falls within the 28 designated industrial source categories (chemical process plants) and is therefore subject to the 100 tpy applicability threshold of criteria pollutants. However, based on the total potential to emit of the plant, as summarized in Table 3-6, the project does not trigger the PSD permitting requirements.

4.2 Nonattainment New Source Review (40 CFR 51.165 and 45CSR19)

The proposed plant is located in the Pleasants County, which is designated as attainment and non-classified area. Therefore, the project will not trigger NNSR permitting requirements.

4.3 Title V Operating Program (40 CFR 70 and 45CSR30)

The Title V Operating Permit program applies to major sources which are facilities that have the potential to emit greater than 100 tons per year of any criteria pollutant, 25 tons per year of HAPs collectively, and 10 tons per year of an individual HAP. The proposed project does not exceed this potential to emit and consequently is a minor source for criteria pollutants and HAPs. Therefore, a Title V Operating Permit will not be required for the project.

4.4 Compliance Assurance Monitoring (40 CFR 64)

The project does not require Compliance Assurance Monitoring (CAM) per 40 CFR 64, which is required only for major source projects under Title V operating permits.

4.5 New Source Performance Standards (40 CFR 60 and 45CSR16)

Section 111 of the Clean Air Act authorizes the EPA to develop technology-based standards which apply to specific categories of stationary sources. These standards are referred to as New Source Performance Standards (NSPS) and are found in 40 CFR Part 60. NSPS standards have been adopted by reference in 45CSR16 for standards in effect as of June 1, 2015. The following NSPS will apply to the proposed facility:

Subpart	Title
A	General Provisions
Kb	Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced after July 23, 1984
VVa	Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemical Manufacturing Industry for Which Construction, Reconstruction, or Modification Commenced after November 7, 2006
NNN	Standards of Performance for VOC Emissions from Synthetic Organic Chemical Manufacturing Industry (SOCMI) Distillation Operations
RRR	Standards of Performance for VOC Emissions from SOCMI Reactor Processes
JJJJ	Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

4.5.1 40 CFR 60 Subpart A – General Provisions

The facility will be subject to the requirements under Subpart A. Subpart A stipulates notification and recordkeeping requirements (40 CFR §60.7), testing requirements (40 CFR §60.8), monitoring requirements (40 CFR §60.13), and flare requirements (40 CFR §60.18(b)).

4.5.2 40 CFR 60 Subpart Kb - Standards of Performance for Volatile Organic Liquid Storage Vessels

Subpart Kb will apply to the 375,000 gallon methanol storage tanks with maximum vapor pressure of 4.95 psia (34.13 kPA) as its capacity is greater than 19,813 gallons and is used to store volatile organic liquids. In addition, the storage tank does not meet the exemption in 60.110b(b) because its capacity is greater than 39,890 gallons and methanol has a maximum true vapor pressure greater than 0.51 psia at the site. The facility will comply with Subpart Kb by utilizing a vapor balance system which is in accordance 60.112b(a)(3). Methanol storage tanks and methanol unloading utilize vapor balance systems. Excess vapors, if present. are routed to SMR burners and offset any natural gas or process/purge gas emissions, therefore present no net emissions. The flue gas from the SMR is subsequently treated by a SCR and oxidation catalyst.

4.5.3 40 CFR 60 Subpart VVa - Standards of Performance for Equipment Leaks of VOC

Subpart VVa will apply to the proposed facility because the facility is a synthetic organic chemical manufacturing industry (SOCMI) facility as defined under 60.481a and produces a chemical (methanol, CAS No. 67-56-1) listed in 40 CFR 60.489. Equipment leaks include leaks from pumps, compressors, relief devices, flanges, valves, etc. Subpart VVa has specific requirements for controls, monitoring, repair, recordkeeping, and reporting. It requires that this facility implement a Leak Detection and Repair (LDAR) program to identify and control leaks to ensure compliance with Subpart VVa.

4.5.4 40 CFR 60 Subpart NNN - Standards of Performance for VOC Emissions SOCMI Distillation Operations

40 CFR 60 Subpart NNN applies to the plant because it produces methanol (CAS No. 67-56-1) which is covered in 40 CFR §60.667 and is an affected facility per 40 CFR §60.66o(b)(1),(2), (3)]. Further, there may be during SSM events a stream exiting the unit to the high pressure flares.

The emissions standards require one of the following:

- Reduce TOC emissions by 98% (weight)
- TOC (less methane and ethane) less than 20 ppmvd @3% O_2
- Use of a flare that meets the specifications of 60.18
- Maintain a TRE index of greater than 1 without VOC control devices.

Because the distillation area has a vent stream routed to the flare, Subpart NNN applies to the project. Combustion of the vent stream in the flare will reduce TOC emissions by 98 percent. Thus, the project will meet the emissions requirements of Subpart NNN.

4.5.5 40 CFR 60 Subpart RRR - Standards of Performance for VOC Emissions from SOCMI Reactor

40 CFR 60 Subpart RRR applies to the plant because it produces methanol (CAS No. 67-56-1) covered in 40 CFR §60.700(a) and is and affected facility per 40 CFR §60.700 (b)(1),(2), (3)].

For each unit, natural gas or purge gases are combusted in the SMR and the exhaust is routed to its associated SCR and oxidation catalyst and then emitted to atmosphere. During non-normal operation, the methanol synthesis section maybe vented to the flare. Therefore, the project is subject to Subpart RRR.

Subpart RRR emissions standards require one of the following:

- Reduce TOC emissions by 98% (weight);
- TOC (less methane and ethane) less than 20 ppmvd @3% O2;
- Use of a flare that meets the specifications of 60.18; or
- Maintain a TRE index of greater than 1 without VOC control devices.

The project will comply with Subpart RRR by reducing TOC by 98 weight percent when the SMR when natural gas is combusted in the SMR. There are no VOCs emitted in SMR when firing process gases. Further the TOC in the gases going to the flare are reduced by 98 weight percent in the flare.

4.5.6 40 CFR 60 Subpart JJJJ- Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

40 CFR 60 Subpart JJJJ applies to stationary spark ignition internal combustion engines. The provisions of this subpart are applicable to stationary spark ignition (SI) internal combustion engines (ICE) with a maximum engine power greater than or equal to 1,350 HP. The emission rates from the SI ICE must not exceed the table below over the entire life of the engine.

	Emissions Standards					
	g/HP-hr			ppmvd at 15% O2		
	NOX	CO	VOC d	NOX	CO	VOC d
Non-Emergency Natural Gas	2	4	1	160	540	86

To ensure compliance, a maintenance program with record keeping and periodic testing is required. Testing is to occur within 1 year of initial engine startup and is subsequently repeated ever every 8,760 hours or 3 years, whichever comes first.

4.6 National Emission Standards for Hazardous Air Pollutants (40 CFR 63 Subpart ZZZZ)

National Emission Standards for Hazardous Air Pollutants (NESHAP) for Stationary Reciprocating Internal Combustion Engines (40 CFR 63, Subpart ZZZZ) – The plant has seven SI RICE generators that are subject to this NESHAP. These emission units must meet the requirements of NESHAP subpart ZZZZ by meeting the requirements of NSPS subparts JJJJ discussed above.

4.7 West Virginia Code of State Regulations (45CSR)

Emissions sources at the Pleasants County Methanol Plant will be required to comply with regulations established by the WVDEP under 45CSR.

The following regulations are applicable to the project.

4.7.1 45CSR2 Particulate Air Pollution from Combustion of Fuel

The particulate air emissions from the SMR stacks will be subject to §45-2-3 (visible emissions) and §45-2-4 (weight emissions standards). The opacity from the units are limited to 10 percent based on a six-minute block average. If the 10 percent opacity cannot be achieved, the applicant may petition for a different opacity standard under §45-2-3. The §45-2-4 limits particulate emissions based on the "type" of combustion unit. For this project, the SMRs employ Type 'b' burning units. The Particulate emissions (pounds per hour [lb/hour]) for the SMR are limited to 0.09 times the heat input of 276 MMBtu/hour, or 24.9 lb/hour.

4.7.2 45CSR13 Permit Requirements

WV 45CSR13 requires a construction permit for projects with sources that have the potential to emit in excess of the following:

- 6 pounds per hour and 10 tons per year of any regulated air pollutant;
- 144 pounds per calendar day, of any regulated air pollutant; and
- 2 pounds per hour or 5 tons per year of hazardous air pollutants considered on an aggregated basis.

The facility will have VOC, NOX, and CO emissions greater than 6 pounds per hour and 10 tons per year. The project will not trigger major source requirements under PSD or NNSR. Therefore, a state minor source permit will be required under 45CSR13.

45CSR13 requires that Public Notice be provided a via a legal advertisement; refer to Attachment P: Public Notice.

4.7.3 45CSR22 Air Quality Management Fees

45CSR22 regulation addresses fees for permits to construct and certificates to operate. All applicants filing for a permit to construct, modify, or relocate must submit a permit application fee of $1,000 per §45-22-3.4a. The project is subject to four NSPS subparts and §45-22-3.4b imposes additional fees for NSPS sources of $1,000. Therefore, the total fee is $2,000.

4.8 Regulatory Analysis Summary

The Pleasants County Methanol Plant will be subject to the following regulations:

Regulation	Finding
40 CFR 52.21 and 45 CSR 14	PSD permit not required
40 CFR 51.165 and 45CSR19	NNSR review is not required
40 CFR 60 Subpart A and 45CSR16	Facility is subject to this Federal NSPS
40 CFR 64	Compliance Assurance Monitoring is not required
40 CFR 70 and 45CSR30	Title V Operating Permit is not required
45 CSR 13	Construction Permit is required

The equipment or areas will be subject to the following requirements.

Equipment or Area	Requirement
Storage Tanks	Federal NSPS at 40 CFR 60 Subpart Kb
Fugitive Equipment Leaks	Federal NSPS at 40 CFR 60 Subpart VVa and WVDEP 45CSR21
Distillation System	Federal NSPS at 40 CFR 60 Subpart NNN
SMR and Methanol Synthesis Section	Federal NSPS at 40 CFR 60 Subpart RRR
Stationary Spark Ignition Engines	Federal NSPS at 40 CFR 60 Subpart JJJJ Federal NESHAP at 40 CFR 63 Subpart ZZZZ
SMR Stacks	WVDEP PM emissions standards at 45CSR2

Application for Construction Permit WVM Pleasants County Methanol Plant

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF AIR QUALITY

601 57th Street, SE
Charleston, WV 25304
(304) 926-0475
www.dep.wv.gov/daq

APPLICATION FOR NSR PERMIT AND TITLE V PERMIT REVISION (OPTIONAL)

PLEASE CHECK ALL THAT APPLY TO **NSR (45CSR13)** (IF KNOWN):

☒ **CONSTRUCTION** ☐ **MODIFICATION** ☐ **RELOCATION**
☐ **CLASS I ADMINISTRATIVE UPDATE** ☐ **TEMPORARY**
☐ **CLASS II ADMINISTRATIVE UPDATE** ☐ **AFTER-THE-FACT**

PLEASE CHECK TYPE OF **45CSR30 (TITLE V)** REVISION (IF ANY):

☐ **ADMINISTRATIVE AMENDMENT** ☐ **MINOR MODIFICATION**
☐ **SIGNIFICANT MODIFICATION**

IF ANY BOX ABOVE IS CHECKED, INCLUDE TITLE V REVISION INFORMATION AS **ATTACHMENT S** TO THIS APPLICATION

FOR TITLE V FACILITIES ONLY: Please refer to "Title V Revision Guidance" in order to determine your Title V Revision options (Appendix A, "Title V Permit Revision Flowchart") and ability to operate with the changes requested in this Permit Application.

Section I. General

1. Name of applicant *(as registered with the WV Secretary of State's Office):*
West Virginia Methanol, Inc.

2. Federal Employer ID No. ***(FEIN):***
82-3396067

3. Name of facility *(if different from above):*
Pleasants County Methanol Plant

4. The applicant is the:
☐ **OWNER** ☐ **OPERATOR** ☒ **BOTH**

5A. Applicant's mailing address:
1 Landy Lane
Cincinnati, OH 45215

5B. Facility's present physical address:
9764 South Pleasants Hwy
St. Marys, WV 26170

6. **West Virginia Business Registration.** Is the applicant a resident of the State of West Virginia? ☒ **YES** ☐ **NO**

– If **YES,** provide a copy of the **Certificate of Incorporation/Organization/Limited Partnership** (one page) including any name change amendments or other Business Registration Certificate as **Attachment A.**
– If **NO,** provide a copy of the **Certificate of Authority/Authority of L.L.C./Registration** (one page) including any name change amendments or other Business Certificate as **Attachment A.**

7. If applicant is a subsidiary corporation, please provide the name of parent corporation:

8. Does the applicant own, lease, have an option to buy or otherwise have control of the *proposed site?* ☒ **YES** ☐ **NO**

– If **YES,** please explain: West Virginia Methanol holds an option to purchase the site.

– If **NO,** you are not eligible for a permit for this source.

9. Type of plant or facility (stationary source) to be **constructed, modified, relocated, administratively updated** or **temporarily permitted** (e.g., coal preparation plant, primary crusher, etc.): Methanol Production Plant

10. North American Industry Classification System **(NAICS)** code for the facility:
325199

11A. DAQ Plant ID No. (for existing facilities only):
NA

11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only):
NA

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

12A.

- For **Modifications, Administrative Updates** or **Temporary permits** at an existing facility, please provide directions to the *present location* of the facility from the nearest state road;
- For **Construction** or **Relocation permits,** please provide directions to the *proposed new site location* from the nearest state road. Include a **MAP** as **Attachment B**.

12.B. New site address (if applicable):	12C. Nearest city or town:	12D. County:
9764 South Pleasants Highway St. Marys, WV 26170	Waverly	Pleasants
12.E. UTM Northing (KM): 4,354.380808	12F. UTM Easting (KM): 469.487967	12G. UTM Zone: 17

13. Briefly describe the proposed change(s) at the facility:
This application is for a new facility.

14A. Provide the date of anticipated installation or change: 10/01/2023
- If this is an **After-The-Fact** permit application, provide the date upon which the proposed change did happen: / /

14B. Date of anticipated Start-Up if a permit is granted: 3/15/2023

14C. Provide a **Schedule** of the planned **Installation** of/**Change** to and **Start-Up** of each of the units proposed in this permit application as **Attachment C** (if more than one unit is involved).

15. Provide maximum projected **Operating Schedule** of activity/activities outlined in this application:
Hours Per Day 24 Days Per Week 7 Weeks Per Year 52

16. Is demolition or physical renovation at an existing facility involved? ☐ **YES** ☒ **NO**

17**. Risk Management Plans.** If this facility is subject to 112(r) of the 1990 CAAA, or will become subject due to proposed changes (for applicability help see www.epa.gov/ceppo), submit your **Risk Management Plan (RMP)** to U. S. EPA Region III.

18**. Regulatory Discussion.** List all Federal and State air pollution control regulations that you believe are applicable to the proposed process *(if known).* A list of possible applicable requirements is also included in Attachment S of this application (Title V Permit Revision Information). Discuss applicability and proposed demonstration(s) of compliance *(if known).* Provide this information as **Attachment D.**

Section II. Additional attachments and supporting documents.

19. Include a check payable to WVDEP – Division of Air Quality with the appropriate **application fee** (per 45CSR22 and 45CSR13).

20. Include a **Table of Contents** as the first page of your application package.

21. Provide a **Plot Plan,** e.g. scaled map(s) and/or sketch(es) showing the location of the property on which the stationary source(s) is or is to be located as **Attachment E** (Refer to ***Plot Plan Guidance***) **.**
- Indicate the location of the nearest occupied structure (e.g. church, school, business, residence).

22. Provide a **Detailed Process Flow Diagram(s)** showing each proposed or modified emissions unit, emission point and control device as **Attachment F.**

23. Provide a **Process Description** as **Attachment G.**
- Also describe and quantify to the extent possible all changes made to the facility since the last permit review (if applicable).

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

24. Provide **Material Safety Data Sheets (MSDS)** for all materials processed, used or produced as **Attachment H.**

– For chemical processes, provide a MSDS for each compound emitted to the air.

25. Fill out the **Emission Units Table** and provide it as **Attachment I.**

26. Fill out the **Emission Points Data Summary Sheet (Table 1 and Table 2)** and provide it as **Attachment J.**

27. Fill out the **Fugitive Emissions Data Summary Sheet** and provide it as **Attachment K.**

28. Check all applicable **Emissions Unit Data Sheets** listed below:

☒ Bulk Liquid Transfer Operations
☐ Chemical Processes
☐ Concrete Batch Plant
☐ Grey Iron and Steel Foundry
☒ General Emission Unit, specify See Section L
☒ Haul Road Emissions
☐ Hot Mix Asphalt Plant
☐ Incinerator
☐ Indirect Heat Exchanger
☐ Quarry
☐ Solid Materials Sizing, Handling and Storage Facilities
☒ Storage Tanks

Fill out and provide the **Emissions Unit Data Sheet(s)** as **Attachment L.**

29. Check all applicable **Air Pollution Control Device Sheets** listed below:

☐ Absorption Systems
☐ Adsorption Systems
☐ Afterburner
☐ Baghouse
☐ Condenser
☐ Electrostatic Precipitator
☒ Flare
☐ Mechanical Collector
☐ Wet Collecting System

☒ Other Collectors, specify HTCR SCR & Oxidation Catalyst and RICE SCR & Oxidation Catalyst

Fill out and provide the **Air Pollution Control Device Sheet(s)** as **Attachment M.**

30. Provide all **Supporting Emissions Calculations** as **Attachment N,** or attach the calculations directly to the forms listed in Items 28 through 31.

31. **Monitoring, Recordkeeping, Reporting and Testing Plans.** Attach proposed monitoring, recordkeeping, reporting and testing plans in order to demonstrate compliance with the proposed emissions limits and operating parameters in this permit application. Provide this information as **Attachment O.**

➢ Please be aware that all permits must be practically enforceable whether or not the applicant chooses to propose such measures. Additionally, the DAQ may not be able to accept all measures proposed by the applicant. If none of these plans are proposed by the applicant, DAQ will develop such plans and include them in the permit.

32. **Public Notice.** At the time that the application is submitted, place a **Class I Legal Advertisement** in a newspaper of general circulation in the area where the source is or will be located (See 45CSR§13-8.3 through 45CSR§13-8.5 and ***Example Legal Advertisement*** for details). Please submit the **Affidavit of Publication** as **Attachment P** immediately upon receipt.

33**. Business Confidentiality Claims.** Does this application include confidential information (per 45CSR31)?

☐ **YES** ☒ **NO**

➢ If **YES,** identify each segment of information on each page that is submitted as confidential and provide justification for each segment claimed confidential, including the criteria under 45CSR§31-4.1, and in accordance with the DAQ's ***"Precautionary Notice – Claims of Confidentiality"*** guidance found in the ***General Instructions*** as **Attachment Q.**

Section III. Certification of Information

34. **Authority/Delegation of Authority.** Only required when someone other than the responsible official signs the application. Check applicable **Authority Form** below:

☐ Authority of Corporation or Other Business Entity
☐ Authority of Partnership
☐ Authority of Governmental Agency
☐ Authority of Limited Partnership

Submit completed and signed **Authority Form** as **Attachment R.**

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

35A. **Certification of Information.** To certify this permit application, a Responsible Official (per 45CSR§13-2.22 and 45CSR§30-2.28) or Authorized Representative shall check the appropriate box and sign below.

Certification of Truth, Accuracy, and Completeness

I, the undersigned ☒ **Responsible Official** / ☐ **Authorized Representative,** hereby certify that all information contained in this application and any supporting documents appended hereto, is true, accurate, and complete based on information and belief after reasonable inquiry I further agree to assume responsibility for the construction, modification and/or relocation and operation of the stationary source described herein in accordance with this application and any amendments thereto, as well as the Department of Environmental Protection, Division of Air Quality permit issued in accordance with this application, along with all applicable rules and regulations of the West Virginia Division of Air Quality and W.Va. Code § 22-5-1 et seq. (State Air Pollution Control Act). If the business or agency changes its Responsible Official or Authorized Representative, the Director of the Division of Air Quality will be notified in writing within 30 days of the official change.

Compliance Certification

Except for requirements identified in the Title V Application for which compliance is not achieved, I, the undersigned hereby certify that, based on information and belief formed after reasonable inquiry, all air contaminant sources identified in this application are in compliance with all applicable requirements.

SIGNATURE Lars W. Scott DATE: 11-23-20

(Please use blue ink) *(Please use blue ink)*

35B. Printed name of signee: Lars W. Scott		35C. Title: Executive Vice President
35D. E-mail: lscott@westvirginiamethanol.com	36E. Phone: 304 973 7260	36F. FAX: NA
36A. Printed name of contact person (if different from above):		36B. Title:
36C. E-mail:	36D. Phone:	36E. FAX:

PLEASE CHECK ALL APPLICABLE ATTACHMENTS INCLUDED WITH THIS PERMIT APPLICATION:

- ☒ **Attachment A: Business Certificate**
- ☒ **Attachment B: Map(s)**
- ☒ **Attachment C: Installation and Start Up Schedule**
- ☒ **Attachment D: Regulatory Discussion**
- ☒ **Attachment E: Plot Plan**
- ☒ **Attachment F: Detailed Process Flow Diagram(s)**
- ☒ **Attachment G: Process Description**
- ☒ **Attachment H: Material Safety Data Sheets (MSDS)**
- ☒ **Attachment I: Emission Units Table**
- ☒ **Attachment J: Emission Points Data Summary Sheet**
- ☒ **Attachment K: Fugitive Emissions Data Summary Sheet**
- ☒ **Attachment L: Emissions Unit Data Sheet(s)**
- ☒ **Attachment M: Air Pollution Control Device Sheet(s)**
- ☒ **Attachment N: Supporting Emissions Calculations**
- ☒ **Attachment O: Monitoring/Recordkeeping/Reporting/Testing Plans**
- ☒ **Attachment P: Public Notice**
- ☐ **Attachment Q: Business Confidential Claims**
- ☐ **Attachment R: Authority Forms**
- ☐ **Attachment S: Title V Permit Revision Information**
- ☒ **Application Fee**

Please mail an original and three (3) copies of the complete permit application with the signature(s) to the DAQ, Permitting Section, at the address listed on the first page of this application. Please DO NOT fax permit applications.

FOR AGENCY USE ONLY – IF THIS IS A TITLE V SOURCE:

- ☐ ***Forward 1 copy of the application to the Title V Permitting Group and:***
- ☐ ***For Title V Administrative Amendments:***
  - ☐ ***NSR permit writer should notify Title V permit writer of draft permit,***
- ☐ ***For Title V Minor Modifications:***
  - ☐ ***Title V permit writer should send appropriate notification to EPA and affected states within 5 days of receipt,***
  - ☐ ***NSR permit writer should notify Title V permit writer of draft permit.***
- ☐ ***For Title V Significant Modifications processed in parallel with NSR Permit revision:***
  - ☐ ***NSR permit writer should notify a Title V permit writer of draft permit,***
  - ☐ ***Public notice should reference both 45CSR13 and Title V permits,***
  - ☐ ***EPA has 45 day review period of a draft permit.***

All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.

ATTACHMENT A: BUSINESS CERTIFICATE

State of West Virginia

Certificate

I, Mac Warner, Secretary of State,
of the State of West Virginia, hereby certify that

WEST VIRGINIA METHANOL, INC

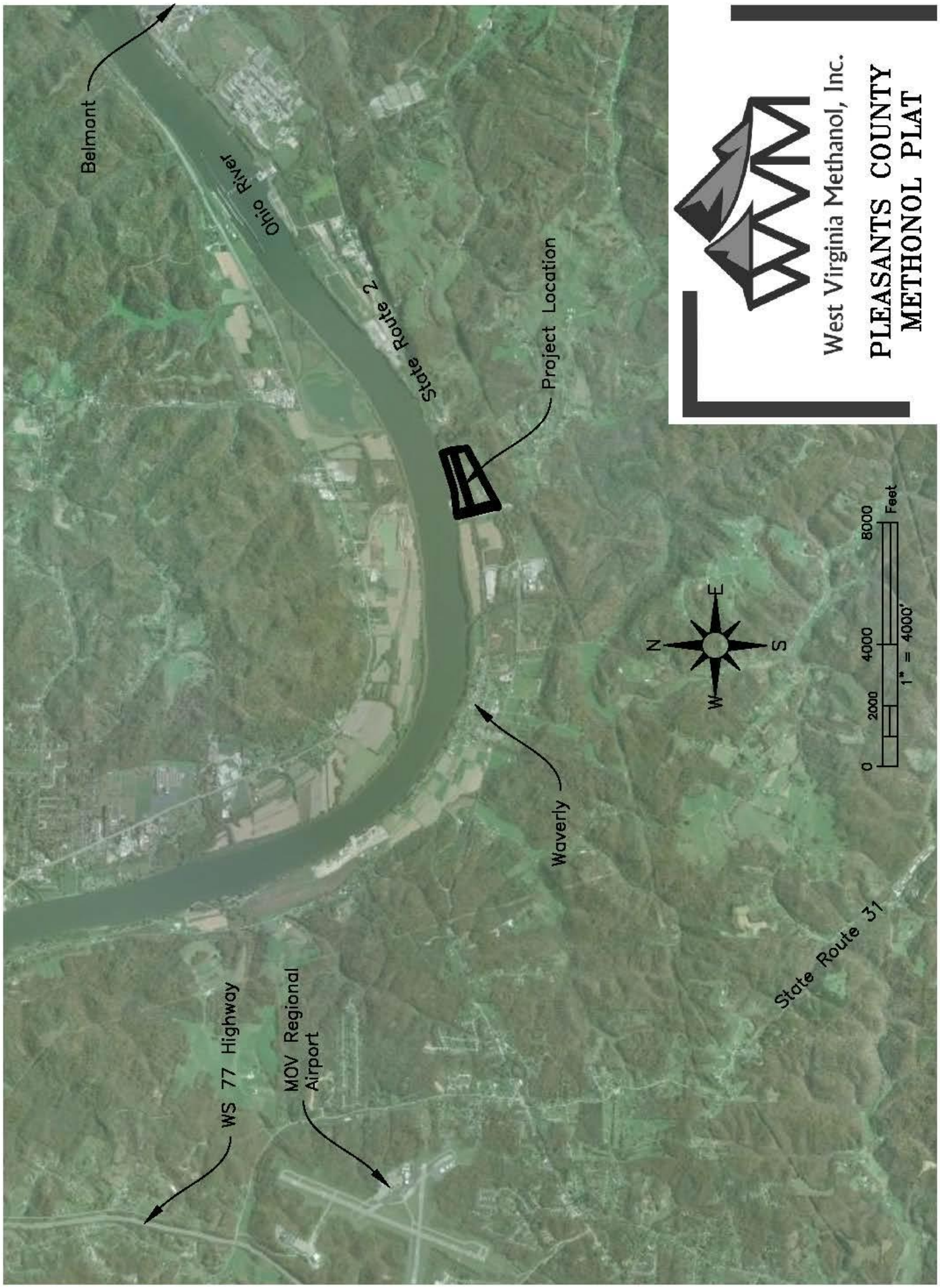
has filed the appropriate registration documents in my office according to the provisions of the West Virginia Code and hereby declare the organization listed above as duly registered with the Secretary of State's Office.

Given under my hand and
the Great Seal of West Virginia
on this day of
April 23, 2020

Mac Warner

Secretary of State

ATTACHMENT B: GENERAL LOCATION MAP


Belmont
Ohio River
State Route 2
Project Location
Waverly
WS 77 Highway
MOV Regional Airport
State Route 31
N
E
S
W
0
2000
4000
8000
Feet
1" = 4000'
West Virginia Methanol, Inc.
PLEASANTS COUNTY
METHONOL PLAT

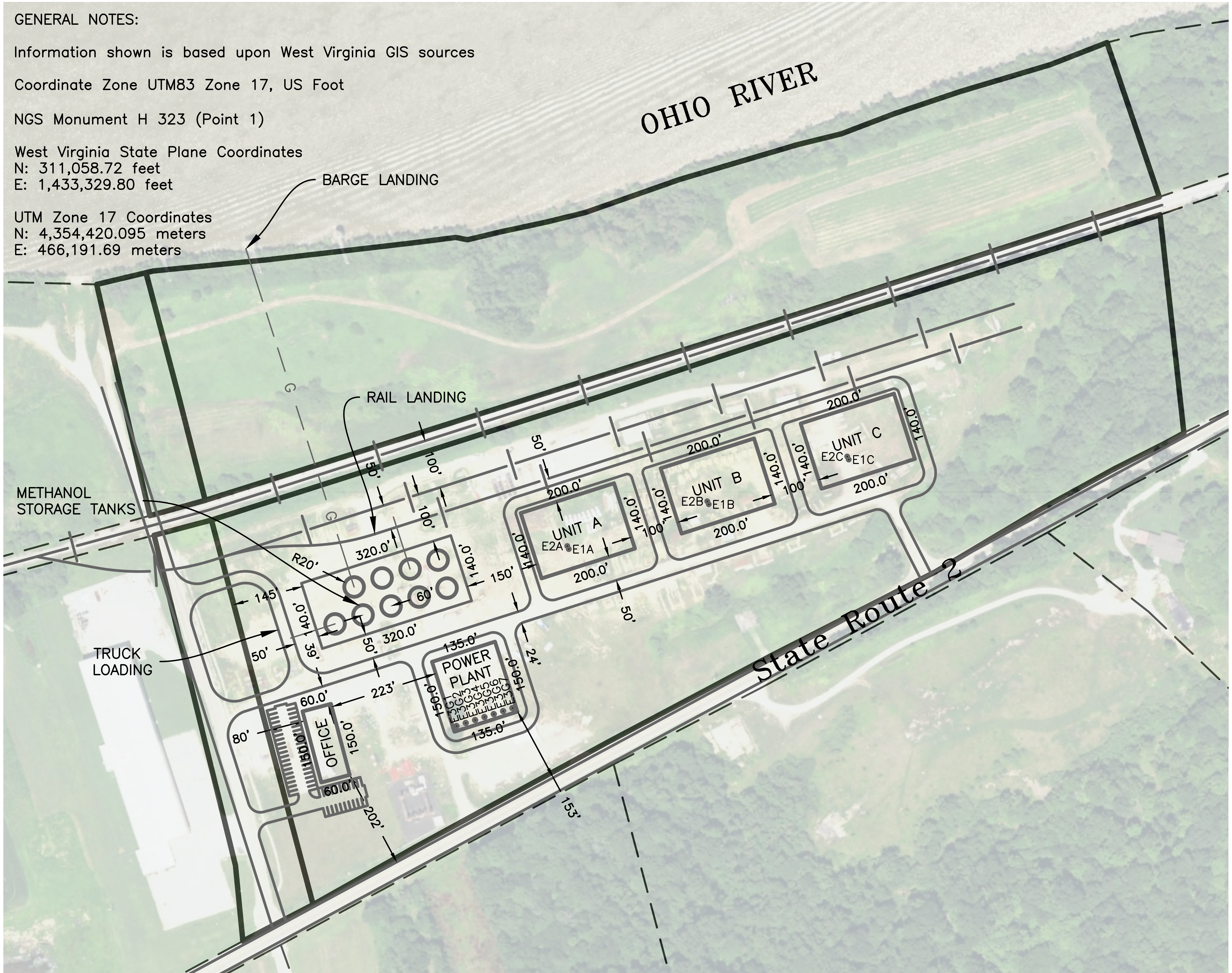
Installation and Start Up Schedule

West Virginia Methanol, Inc., anticipates commencement of construction by May 15, 2021, pending receipt of a construction permit from WVDEP and other required permits. The start-up of the first methanol unit and power plant should occur approximately 24 months after the commencement of construction. This will be followed by the second methanol unit starting up approximately 27 months after the commencement of construction and the third methanol unit approximately 30 months after the commencement of construction.

REGULATORY DISCUSSION

Refer to the write-up in Section 4: Regulatory Review.

ATTACHMENT E: PLOT PLAN



N W E S

0 100 200 400 Feet
1" = 200'

Coordinates shown are
UTM83 Zone 17, Meter

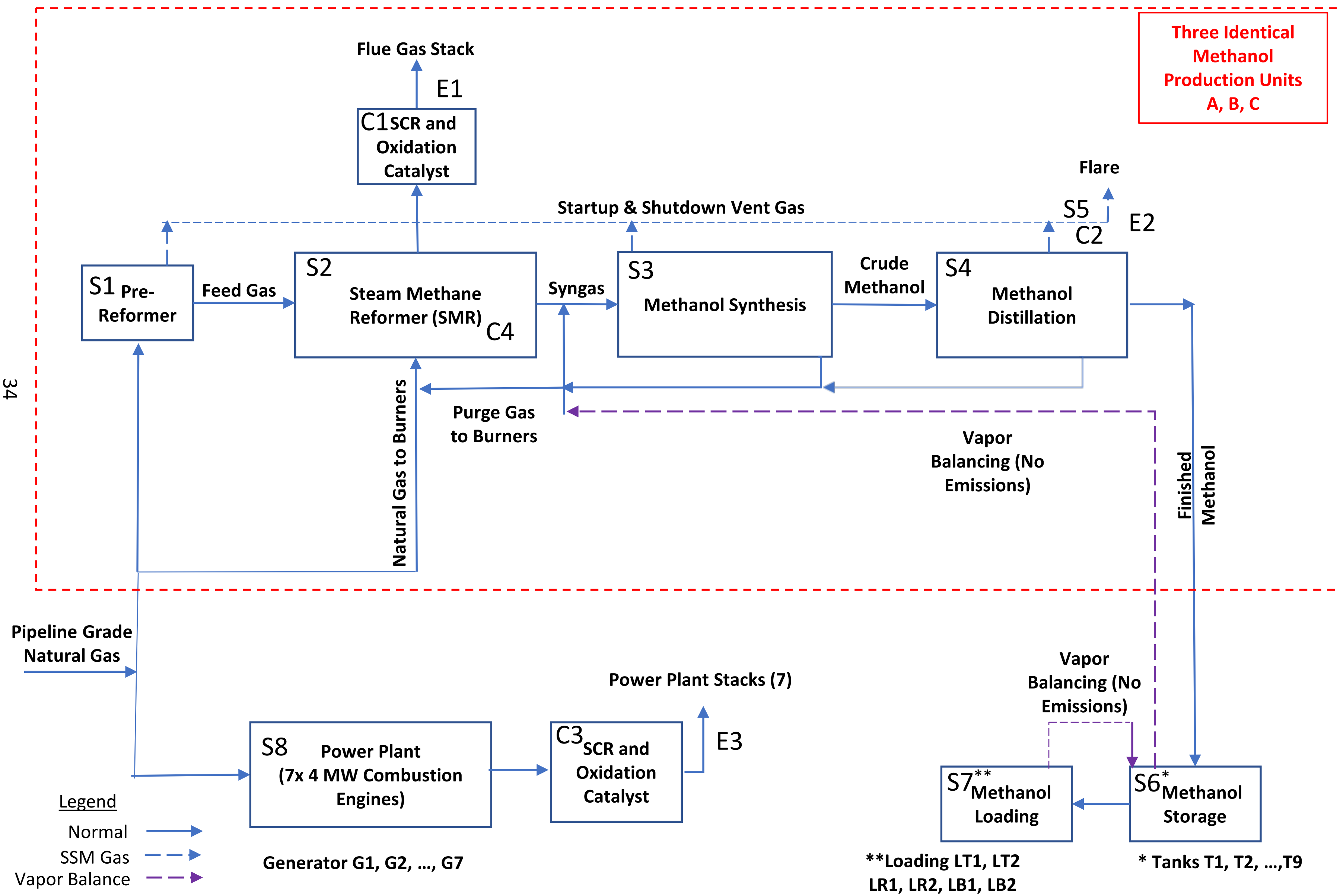
Point Table		
Point I.D.	Northing	Easting
H 323	4354420.095	466191.698
E3G1	4354270.751	469418.055
E3G2	4354272.609	469423.861
E3G3	4354274.467	469429.667
E3G4	4354276.325	469435.473
E3G5	4354278.183	469441.279
E3G6	4354280.040	469447.085
E3G7	4354281.898	469452.891
E1A	4354380.808	469487.967
E2A	4354380.808	469487.967
E1B	4354408.675	469575.058
E2B	4354408.675	469575.058
E1C	4354436.542	469662.148
E2C	4354436.542	469662.148

West Virginia Methanol, Inc.

PLEASANTS COUNTY
METHONOL PLAT

ATTACHMENT F: DETAILED PROCESS FLOW DIAGRAM

West Virginia Methanol – Pleasants County Methanol Plant – General Process Flow Diagram



ATTACHMENT G: PROCESS DESCRIPTION

PROCESS DESCRIPTION

Section 2, Project Description, provides a process description and identifies the major plant components:

- Pre-Reformer Section
- Steam Methane Reformer
- Methanol synthesis section
- Methanol distillation system
- Methanol storage
- Methanol loading
- Power plant

Section 3, Emissions Inventory, further discusses the emissions units and provides additional process description including details regarding the operation of the plant.

ATTACHMENT H: MATERIAL SAFETY DATA SHEETS

www.sigmaaldrich.com

SAFETY DATA SHEET

Version 6.6
Revision Date 08/21/2020
Print Date 08/29/2020

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name	:	Methanol
Product Number	:	322415
Brand	:	Sigma-Aldrich
Index-No.	:	603-001-00-X
CAS-No.	:	67-56-1

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	:	Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich Inc. 3050 Spruce Street ST. LOUIS MO 63103 UNITED STATES
Telephone	:	+1 314 771-5765
Fax	:	+1 800 325-5052

1.4 Emergency telephone

Emergency Phone #	:	800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 2), H225
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Inhalation (Category 3), H331
Acute toxicity, Dermal (Category 3), H311
Specific target organ toxicity - single exposure (Category 1), Eyes, H370

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)	
H225	Highly flammable liquid and vapor.
H301 + H311 + H331	Toxic if swallowed, in contact with skin or if inhaled.
H370	Causes damage to organs (Eyes).

Precautionary statement(s)	
P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P311	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor.
P307 + P311	IF exposed: Call a POISON CENTER or doctor/ physician.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms : Methyl alcohol

Formula : CH_4O

Molecular weight : 32.04 g/mol
CAS-No. : 67-56-1
EC-No. : 200-659-6
Index-No. : 603-001-00-X

Component	Classification	Concentration
Methanol		
	Flam. Liq. 2; Acute Tox. 3; STOT SE 1; H225, H301, H331, H311, H370	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures
No data available

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Foam Carbon dioxide (CO_2) Dry powder Water

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Nature of decomposition products not known.
Combustible.

5.3 Advice for firefighters
No data available

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
For personal protection see section 8.

6.2 Environmental precautions
No data available

6.3 Methods and materials for containment and cleaning up
No data available

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
No data available

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Methanol	67-56-1	TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Headache Nausea Dizziness Eye damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Danger of cutaneous absorption		
		STEL	250 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Headache Nausea Dizziness Eye damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Danger of cutaneous absorption		
		TWA	200 ppm 260 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		ST	250 ppm 325 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		TWA	200 ppm 260 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		C	1,000 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
		PEL	200 ppm 260 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

		STEL	250 ppm 325 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Methanol	67-56-1	Methanol	15 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

Derived No Effect Level (DNEL)

Application Area	Routes of exposure	Health effect	Value
Workers	Skin contact	Long-term systemic effects	40mg/kg BW/d
Consumers	Skin contact	Long-term systemic effects	8mg/kg BW/d
Consumers	Ingestion	Long-term systemic effects	8mg/kg BW/d
Workers	Skin contact	Acute systemic effects	40mg/kg BW/d
Consumers	Skin contact	Acute systemic effects	8mg/kg BW/d
Consumers	Ingestion	Acute systemic effects	8mg/kg BW/d
Workers	Inhalation	Acute systemic effects	260 mg/m3
Workers	Inhalation	Acute local effects	260 mg/m3
Workers	Inhalation	Long-term systemic effects	260 mg/m3
Workers	Inhalation	Long-term local effects	260 mg/m3
Consumers	Inhalation	Acute systemic effects	50 mg/m3
Consumers	Inhalation	Acute local effects	50 mg/m3
Consumers	Inhalation	Long-term systemic effects	50 mg/m3
Consumers	Inhalation	Long-term local effects	50 mg/m3

Predicted No Effect Concentration (PNEC)

Compartment	Value
Soil	23.5 mg/kg
Sea water	15.4 mg/l
Fresh water	154 mg/l
Fresh water sediment	570.4 mg/kg
Onsite sewage treatment plant	100 mg/kg

8.2 Exposure controls

Personal protective equipment

Skin protection

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact
Material: butyl-rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min

Material tested:Butoject® (KCL 898)

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Viton®
Minimum layer thickness: 0.7 mm
Break through time: 120 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent product from entering drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Color: colorless
b)	Odor	characteristic
c)	Odor Threshold	10 ppm
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -98 °C (-144 °F)
f)	Initial boiling point and boiling range	64.7 °C 148.5 °F
g)	Flash point	11.0 °C (51.8 °F) - closed cup
h)	Evaporation rate	6.3 - Diethyl ether1.9 - n-butyl acetate
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 44 %(V) Lower explosion limit: 5.5 %(V)
k)	Vapor pressure	128 hPa at 20 °C (68 °F)
l)	Vapor density	1.11
m)	Relative density	0.791 g/mL at 25 °C (77 °F)
n)	Water solubility	1,000 g/l at 20 °C (68 °F) - completely misciblesoluble
o)	Partition coefficient: n-octanol/water	log Pow: -0.77 at 25 °C (77 °F) - (Lit.), Bioaccumulation is not expected.

p)	Autoignition temperature	455.0 °C (851.0 °F) at 1,013 hPa - DIN 51794
q)	Decomposition temperature	Distillable in an undecomposed state at normal pressure.
r)	Viscosity	0.54 - 0.59 mm2/s at 20 °C (68 °F) -
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Minimum ignition energy	0.14 mJ
Conductivity	< 1 µS/cm
Relative vapor density	1.11

SECTION 10: Stability and reactivity

10.1 Reactivity
Vapors may form explosive mixture with air.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
Risk of explosion with:Oxidizing agents, Halogens, sodium hypochlorite, sulfuric acid, nitrogen oxides, chlorates, chromium(VI) oxide, chromosulfuric acid, halogen oxides, hydrides, salts of oxyhalogenic acids, perchlorates, perchloric acid, permanganic acid, hydrogen peroxide, zinc diethyl, nonmetallic oxides, powdered magnesium, Nitric acidExothermic reaction with:Acids, Chloroform, Acid anhydrides, Reducing agents, Bromine, Chlorine, tetrachloromethane, acid halides, magnesiumRisk of ignition or formation of inflammable gases or vapours with:Fluorine, Oxides of phosphorus, Raney-nickelGenerates dangerous gases or fumes in contact with:Alkali metals, Alkaline earth metals

10.4 Conditions to avoid
Warming.

10.5 Incompatible materials
various plastics, magnesium, zinc alloys

10.6 Hazardous decomposition products
Other decomposition products - No data available
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LDLo Oral - Human - 143 mg/kg
Remarks: (RTECS)
LC50 Inhalation - Rat - male and female - 4 h - 131.25 mg/l
Remarks: (ECHA)
LD50 Dermal - Rabbit - 17,100 mg/kg
Remarks: (External MSDS)
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation
Remarks: (ECHA) Drying-out effect resulting in rough and chapped skin.

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation
Remarks: (ECHA)
Possible damages: Irritations of mucous membranes

Respiratory or skin sensitization
Sensitisation test: - Guinea pig
Result: negative
(OECD Test Guideline 406)

Germ cell mutagenicity
Based on available data the classification criteria are not met.
In vitro mammalian cell gene mutation test
Chinese hamster lung cells
Result: negative
Ames test
Salmonella typhimurium
Result: negative
OECD Test Guideline 474
Mouse - male and female - Bone marrow
Result: negative

Carcinogenicity
Did not show carcinogenic effects in animal experiments.

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
Based on available data the classification criteria are not met.

Specific target organ toxicity - single exposure
Causes damage to organs. - Eyes
Acute oral toxicity - Nausea, Vomiting
Acute inhalation toxicity - Irritation symptoms in the respiratory tract.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No aspiration toxicity classification

Additional Information
RTECS: PC1400000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Systemic effects:
acidosis, drop in blood pressure, agitation, spasms, inebriation, Dizziness, Drowsiness, Headache, Impairment of vision, Blindness, narcosis, Coma
Symptoms may be delayed.
Damage to:
Liver, Kidney, Cardiac, Irreversible damage of the optical nerve.
Other dangerous properties can not be excluded.
This substance should be handled with particular care.

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Lepomis macrochirus (Bluegill) - 15,400.0 mg/l - 96 h (US-EPA)
Toxicity to daphnia and other aquatic invertebrates	semi-static test EC50 - Daphnia magna (Water flea) - 18,260 mg/l - 96 h (OECD Test Guideline 202)
Toxicity to algae	static test ErC50 - Pseudokirchneriella subcapitata (green algae) - ca. 22,000.0 mg/l - 96 h (OECD Test Guideline 201)
Toxicity to bacteria	static test IC50 - activated sludge - > 1,000 mg/l - 3 h (OECD Test Guideline 209)

12.2 Persistence and degradability

Biodegradability	Result: 99 % - Readily biodegradable. (OECD Test Guideline 301D)
Biochemical Oxygen Demand (BOD)	600 - 1,120 mg/g Remarks: (IUCLID)
Chemical Oxygen Demand (COD)	1,420 mg/g Remarks: (IUCLID)
Theoretical oxygen demand	1,500 mg/g Remarks: (Lit.)
Ratio BOD/ThBOD	76 % Remarks: Closed Bottle test(IUCLID)

12.3 Bioaccumulative potential

Bioaccumulation	Cyprinus carpio (Carp) - 72 d at 20 °C - 5 mg/l(Methanol) Bioconcentration factor (BCF): 1.0

12.4 Mobility in soil

Will not adsorb on soil.

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

Additional ecological information	Avoid release to the environment.
Stability in water	at 19 °C83 - 91 % - 72 h Remarks: Hydrolyzes on contact with water.Hydrolyzes readily.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

No data available

SECTION 14: Transport information

DOT (US)

UN number: 1230 Class: 3 Packing group: II
Proper shipping name: Methanol
Reportable Quantity (RQ): 5000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1230 Class: 3 (6.1) Packing group: II EMS-No: F-E, S-D
Proper shipping name: METHANOL

IATA

UN number: 1230 Class: 3 (6.1) Packing group: II
Proper shipping name: Methanol

SECTION 15: Regulatory information

SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Methanol	67-56-1	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

Version: 6.6 Revision Date: 08/21/2020 Print Date: 08/29/2020

SOUTHWEST GAS CORPORATION

SAFETY DATA SHEET

1. Product and Company Identification

Material name	**Natural Gas - Odorized**
Revision date	September 9, 2019
SDS number	SWG SDS 1
Product use	Fuel gas.
Manufacturer/Supplier	Southwest Gas Corporation P.O. Box 98510, Las Vegas, NV 89150-0002 Telephone: (702) 876-7011 Contact Person: Corporate Safety Department
Emergency	877-860-6020

2. Hazards Identification

Physical state	Gas.
Appearance	Colorless gas.
Odor	Gassy, sulfurous, rotten egg type odor.
Emergency overview	DANGER Flammable gas - may cause flash fire. Gas reduces oxygen available for breathing.
OSHA regulatory status	This product is hazardous according to OSHA 29 CFR 1910.1200.
Potential health effects	
Routes of exposure	Inhalation.
Eyes	Pressurized gas, and contaminants within piping, may cause mechanical injury.
Skin	Pressurized gas, and contaminants within piping, may cause mechanical injury.
Inhalation	Sufficient concentrations can displace oxygen in the air and can cause symptoms of oxygen deprivation (asphyxiation), including unconsciousness.
Ingestion	Not applicable.
Target organs	Not applicable.
Chronic effects	Not applicable.
Signs and symptoms	Not applicable.
Potential environmental effects	Not expected to be harmful to aquatic organisms.

3. Composition / Information on Ingredients

Components	CAS #	Percent
Natural Gas	8006-14-2	100

(Includes a blend of tertiary-Butyl Mercaptan and Tetrahydrothiophene of <0.1% mole; ≤5 grains total sulfur per standard cubic foot)

Primary constituents of natural gas	CAS #	Percent
Butane	106-97-8	Varies
Carbon dioxide	124-38-9	Varies
Ethane	74-84-0	Varies
Methane	74-82-8	Varies
Pentane	109-66-0	Varies
Propane	74-98-6	Varies

4. First Aid Measures

First aid procedures

Eye contact	Not applicable. No effects expected.
Skin contact	Not applicable. No effects expected.
Inhalation	Remove victim to fresh air. If not breathing, clear airway and start mouth-to-mouth artificial respiration or use a bag-mask respirator. Get immediate medical attention. If the victim is having trouble breathing, transport to medical care and if available, give supplemental oxygen.
Ingestion	This material is a gas under normal atmospheric conditions and ingestion is unlikely.
Notes to physician	Provide general supportive measures and treat symptomatically.
General advice	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire Fighting Measures

Flammable properties	Flammable gas. Gas forms mixtures with air which can ignite and burn with explosive violence. Gas is lighter than air and explosive mixtures may occur if gas is released into enclosed or confined areas. Gas leaking from underground piping may travel through soil and into nearby structures and underground facilities, and may create explosion hazards within those structures. Gas entry into sewer, conduit, or abandoned underground pipe may create explosion hazards within those underground facilities and within structures attached to those underground facilities.
Extinguishing media	
Suitable extinguishing media	Extinguish with carbon dioxide, dry powder, or foam.
Unsuitable extinguishing media	Water may be ineffective on flames but useful for other purposes, including cooling.

Protection of firefighters

Specific hazards arising from the chemical	During fire, combustion gases may be formed that are hazardous to health.
Protective equipment and precautions for firefighters	Evacuate area and fight fire from a safe distance. Extinguish the fire by stopping the flow of gas. If leak is from Southwest Gas facilities, do not stop the flow of gas but call the appropriate Southwest Gas emergency number for gas control assistance. The gas could form an explosive mixture with air and re-ignite resulting in a sudden violent flash fire, which may cause far more damage than if the original fire had been allowed to burn.
Specific methods	In the event of fire or explosion do not breathe fumes. Do not enter a gaseous or suspected gaseous environment without first checking the gas concentration with a properly calibrated combustible gas indicator. If gas is detected, do not enter without first eliminating potential ignition sources (see Section 6); without appropriate lockout-tagout safeguards; without appropriate personal protective equipment, such as flame resistant clothing that is treated to avoid static buildup; without an emergency retrieval-system (defined in Section 16), such as a harness with a retrieval line; without self-contained or supplied breathing air; and without a fire-watch (defined in Section 16) stationed outside the gaseous environment that is equipped with an appropriate fire suppressant.

6. Accidental Release Measures

General	Any suspected natural gas leak requires immediate emergency action.
Hazard recognition	Natural gas is likely to be present if a sulfurous or unusual odor, like rotten eggs is detected. A dangerous concentration of natural gas may be present if the odor is constant or momentary, or if the odor is strong or slight. **Extreme caution is called for since the potential for death or serious injury from a flash fire or explosion is very great if a leak, a suspected leak, or odor is ignored.** As explained in Section 7, persons should not rely solely on their sense of smell to determine if a gas leak exists or if natural gas is present. Other indications that a natural gas leak may be present and that call for extreme caution include: damaged or worn hoses, fittings, or other connections to a gas appliance or piping; discolored or dead vegetation over or near pipelines; dirt or water being thrown in the air; hissing, whistling, or roaring sound near a gas pipe; bubbling water (including water in a toilet bowl); burning soil; a fire or explosion near a pipeline; an exposed pipe after an earthquake, flood, or other natural disaster; or physical symptoms from exposure that may include dizziness, light-headedness, headache, nausea, loss of coordination, or eye irritation.
Emergency action	Immediately stop all hot-work (defined in Section 16). Immediately evacuate all personnel from all suspected leak areas and areas that may be impacted by the ignition of natural gas. Activate the evacuation procedures of the facility's Emergency Action Plan, but do not activate any electric alarm or communication systems. Secure all such areas to prevent entry or reentry. From a safe location, call 911 and Southwest Gas at (877) 860-6020 and follow the instructions given.
Prevention of ignition	All existing **ignition sources**, including but not limited to open **flames** or **embers** (such as water heaters, fire in boilers, pilot lights, blow torches, matches, candles, lighters, cigarettes, cigars or pipes), should be extinguished if it is possible to do so without entering the suspected leak area. **Static electricity discharges** and **electrical arcing** can be potential ignition sources and should be avoided. If it can be done safely, turn off the gas supply to the affected equipment or piping system and disconnect any electrical supply at a circuit breaker or elsewhere outside the affected structure or area. However, do not do so without first verifying the absence of gas in the switch with a properly calibrated combustible gas indicator. Sources of static electricity and electrical arcing include, but are not limited to, torch igniters, cutting or welding, friction of certain clothing; charges within natural gas and gas piping; the use of tools that are

	not spark-proof, the use of equipment that is not explosion-proof (or is not within explosion-proof enclosures), and the use of non-intrinsically safe electrical switches, illumination, thermostats, fans, motors (including motor operated doors), battery operated equipment, and electronic equipment. **Hot surfaces** that are at or above the auto-ignition temperature can be potential ignition sources and should be cooled if it is possible to do so without entering the suspected leak area.
Precautions for entering a gaseous environment	Do not enter a gaseous or suspected gaseous environment without first checking the gas concentration with a properly calibrated combustible gas indicator. If gas is detected, do not enter without first eliminating potential ignition sources; without appropriate lockout-tagout safeguards; without appropriate personal protective equipment, such as flame resistant clothing that is treated to avoid static buildup; without an emergency retrieval-system (defined in Section 16), such as a harness with a retrieval line; without self-contained breathing air; and without a fire-watch (defined in Section 16) stationed outside the gaseous environment that is equipped with an appropriate fire suppressant.
Precautions if the release is from Southwest Gas operated pipelines or facilities	If the release is from Southwest Gas operated pipelines or facilities: • Move to a safe location and call 911 and Southwest Gas at (877) 860-6020 • Communicate requested information to Southwest Gas emergency dispatch • Secure the area and keep persons and traffic from entering • Wait for the Fire Department and Southwest Gas emergency crews to arrive • Don't enter the area where natural gas is escaping • Don't smoke or use lighters or matches • Eliminate sources of ignition, such as sparks or flames • Don't move equipment, or turn it on or off, near the release • Don't attempt to repair any damage or control the flow of natural gas • Don't attempt to extinguish a fire should ignition occur
Additional reference information	NFPA 329, *Recommended Practice for Handling Releases of Flammable and Combustible Liquids and Gases* (2020).

7. Handling and Storage

General	Southwest Gas adheres to United States Department of Transportation (DOT) and all applicable state rules and regulations regarding the odorizing of natural gas. **Decades of experience has established that the addition of chemical odorants to natural gas has proven to be a safe, reliable and effective means to warn of the presence of leaks.** However, this odorization is only one phase of protection and so one should not rely on their sense of smell alone to determine if there is a gas leak or other dangerous concentrations of natural gas; other practices for minimizing and locating gas leaks should be employed. Specifically, odorization provides added protection by allowing persons to detect the presence of natural gas, but is not a substitute for proper installation, use, protection, and upkeep of gas systems and appliances. All gas pipe should be designed, installed and inspected as required by the applicable fire code, plumbing code, mechanical code, fuel gas code and administrative code prior to operation. After installation, all gas pipe should be properly maintained and protected from damage because the primary cause of leakage from underground gas pipes is damage by third parties. Please see the back of the bill to obtain information about the need to inspect, maintain and repair customer-owned service lines that are not maintained by Southwest Gas. Appliance and equipment manufacturers' instruction manuals should be followed for their recommended installation, operation, maintenance, and inspection practices, even if those practices conflict with the practices contained in this safety data sheet.

Other Precautions

Impaired sense of smell and environmental conditions that reduce odorant effectiveness	As noted above, persons should not rely solely on their sense of smell to determine if a gas leak exists or if natural gas is present. Some persons may not be able to detect the added odorant because they have a diminished or impaired sense of smell or olfactory fatigue. It has been reported that exposure to extreme cold may temporarily impair the ability to smell. Some people suffer from temporary or permanent anosmia. That is, they have no sense of smell. When a person's ability to smell natural gas odorant is in doubt, the person may undergo an evaluation by a physician or other licensed health care professional. Certain environmental conditions including competing odors may cover up or mask the smell of odorized gas. **Special precautions, including but not limited to the use of gas detection equipment, should be taken by persons using odorized gas or persons who may be exposed to planned or accidental releases of odorized gas, where those persons have a diminished or impaired sense of smell or work in environments that may mask or reduce the effectiveness of the odorant.**
Odor fade	Certain conditions cause **odor fade**, a phenomenon that causes the odorant to diminish so that it is not as detectable and, in some cases, is not detectable at all. Persons should not rely on their sense of smell alone to detect the presence of natural gas without first considering the presence or absence of conditions that may cause odor fade and without advance consideration of the potential for the creation or presence of a flammable concentration of odor-faded gas. **Odor fade (loss of odorant)** occurs when the level of odorant in the gas is reduced due to physical and/or chemical processes including adsorption, absorption and oxidation. This causes the effectiveness of odorant as a warning agent to be reduced. In piping systems conveying dry natural gas, like that delivered by Southwest Gas, odor fade occurs predominantly in installations of new pipe rather than in pipe that has been in continuous use. It is generally more pronounced in new steel pipe of larger diameters and longer lengths with intermittent, little or no gas flow through the piping system over an extended period of time. Other factors that may cause odor fade in a gas piping system include: the construction and configuration of the gas piping system; the presence of rust, moisture, liquids or other substances in the pipe; and gas composition, pressure and/or flow. In industrial, commercial, and public applications and in large residential applications such as housing tracts and residential towers, new pipeline installations may require periodic purging, the conditioning of the pipe, or fuel gas system modifications (including pressure reduction) during start-up operations to prevent occurrences of odor fade. If Southwest Gas conditioned the customer's pipe before it was placed into service, contact Southwest Gas for instruction on work controls and personal protective equipment recommendations before cutting the pipe with an oxyacetylene torch or welding pipe that is near to, and downstream of, the odorant injection point(s). If a natural gas leak occurs underground, the surrounding soil may cause odor fade. Inspections for underground gas leaks should include looking for discolored or dead vegetation over or near pipe areas. Immediately call the appropriate Southwest Gas emergency number (Section 1) if odor-faded gas is detected or suspected and follow the instructions given by the emergency dispatch.
Purging gas piping	**Gas piping should only be purged by a licensed professional** that is fully trained and knowledgeable about safe gas purging practices, the proper use of gas detectors, and the danger of relying on the sense of smell alone to detect the presence of gas during purging operations. An improperly performed purge may cause serious bodily injury or death to the person(s) performing the purge and to all other persons in the affected area. Piping purges shall be performed in accordance with Section 8.3 of NFPA 54, *National Fuel Gas Code* or with NFPA 56, *Standard for Fire Explosion Prevention During Cleaning and Purging of Flammable Gas Piping Systems*, as applicable.

Immediately call the Southwest Gas emergency number if odor-faded gas is detected or suspected and follow the instructions given by the emergency dispatch.

Do not purge the contents of a gas pipe into a confined space. (See 29 CFR 1910.146).

Consider stopping hot-work (defined in Section 16) in the area receiving the product of the purge.

Special additional precautions should be taken when purging piping systems that contain extensive branch piping, that cannot maintain appropriate purge velocities, or that are exceptionally large. For example, Southwest Gas employs special precautions when purging its pipelines that cannot maintain a purge velocity greater than 200 feet per minute or are 6 inches or larger with a volume of 200 cubic feet or more. Special precautions may include but are not limited to

- Preparing and following a written purge plan that minimizes gas mixing due to turbulence, minimizes the stratification of gases within the piping, and addresses the diffusion due to the contact duration of the gases;
- Evacuating nonessential personnel;
- Providing supplemental ventilation with appropriate equipment that discharges the air away from the enclosed space, such as a grounded air-ejector (defined in Section 16);
- Wearing flame-resistant clothing that is appropriately treated to avoid static buildup;
- Eliminating open flames and other ignition sources;
- Employing appropriate lockout-tagout safeguards to control access to piping and valves and to control access to ignition sources including electrical switches, circuit breakers, appliances, equipment, and motors;
- Purging at a controlled rate that takes into account the volume of gas or air displaced from the gas piping, the amount of ventilation present, and the volume of the enclosed premises or structure receiving the product of the purge; and

Using gas detection equipment at appropriate locations within an enclosed space where the purged gases are released and stopping the purge upon the detection of a concentration of gas.

Additional reference information

(1) National Fire Protection Association's NFPA 54, *National Fuel Gas Code* (2018); NFPA 56, *Standard for Fire and Explosion Prevention During Cleaning and Purging of Flammable Gas Piping Systems* (2017); National Fire Protection Association's NFPA 70, *National Electrical Code*, Chapter 5, Special Occupancies (2017); NFPA 72, *National Fire Alarm and Signaling Code* (2010); and NFPA 77, *Recommended Practice on Static Electricity* (2019).

(2) American Gas Association's *Purging Manual* (2018) and *Gas Engineers Handbook* (1965).

8. Exposure Controls / Personal Protection

Occupational exposure limits

ACGIH Components	Type	Value
Butane (106-97-8)	TWA	1000 ppm
Carbon dioxide (124-38-9)	STEL	30000 ppm
	TWA	5000 ppm
Ethane (74-84-0)	TWA	1000 ppm
Methane (74-82-8)	TWA	1000 ppm
Natural Gas (8006-14-2)	TWA	1000 ppm
Pentane (109-66-0)	TWA	600 ppm
Propane (74-98-6)	TWA	1000 ppm

U.S. – OSHA Components	Type	Value
Butane (106-97-8)	TWA	800 ppm
		1900 mg/m3
Carbon dioxide (124-38-9)	PEL	9000 mg/m3
		5000 ppm
	STEL	30000 ppm
		54000 mg/m3
	TWA	18000 mg/m3
		10000 ppm
Pentane (109-66-0)	PEL	1000 ppm
		2950 mg/m3
	STEL	2250 mg/m3
		750 ppm
	TWA	600 ppm
		1800 mg/m3
Propane (74-98-6)	PEL	1800 mg/m3
		1000 ppm
	TWA	1000 ppm
		1800 mg/m3

Exposure guidelines OSHA: The acceptable max. peak above the ceiling concentration for an 8-hour shift is: 50 ppm. The acceptable duration of the peak above the ceiling concentration is: 10 minutes once, only if no other measurable exposure occurs

Engineering controls See Section 7.

Personal protective equipment

Eye / face protection Wear safety glasses, goggles, or face shields around pressurized systems.

Skin protection Wear gloves.

Clothing Wear flame resistant outer garments. Wear long sleeves and long pants.

Respiratory protection In case of inadequate ventilation or in the case of pressurized gas displacing the air, use a supplied-air respirator.

9. Physical & Chemical Properties

Appearance Colorless gas.

Color Not relevant.

Odor Sulfurous, rotten egg type odor.

Odor threshold Readily detectable by a person with a normal sense of smell at a concentration in air of one-fifth of the lower flammability limit.

Physical state Gas.

Form Gas.

pH Not relevant.

Melting point Not available.

Freezing point Not available.

Boiling point -258.7 °F (-161.5 °C)

Flash point -297.8 °F (-183.2 °C) (Methane) Cleveland Closed Cup

Evaporation rate Not available.

Flammability Not available.

Flammability limits in air, upper, % by volume 14 - 15

Flammability limits in air, lower, % by volume 4 - 5

Vapor pressure	Not available.
Vapor density	Not relevant.
Specific gravity	0.56 - 0.625 at 60°F (15°C)
Solubility (water)	Insoluble.
Partition coefficient (n-octanol/water)	No data available.
Auto-ignition temperature	900 - 1170 °F (482.2 - 632.2 °C)
Decomposition temperature	Not available.
Viscosity	Not relevant.

10. Chemical Stability & Reactivity Information

Chemical stability	Stable at normal conditions.
Conditions to avoid	Heat, flames and sparks.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	Carbon dioxide. Carbon monoxide.
Possibility of hazardous reactions	Hazardous polymerization does not occur.

11. Toxicological Information

Toxicological data

Components	Test Results
Butane (106-97-8)	Acute Inhalation LC50 Rat: 658 mg/l 4 Hours
Pentane (109-66-0)	Acute Inhalation LC50 Rat: 364 mg/l 4 Hours
Propane (74-98-6)	Acute Inhalation LC50 Rat: > 1442.847 mg/l 15 Minutes
Methane (74-82-8)	Not available

Acute effects	Asphyxiants displace oxygen in the air and can cause symptoms of oxygen deprivation (asphyxiation): breathing of high vapor concentrations may cause dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness. .
Local effects	Contact with compressed gas can cause damage (frostbite) due to rapid evaporative cooling.
Sensitization	Not a skin sensitizer.
Chronic effects	No data available.
Carcinogenicity	No data available.
Mutagenicity	No data available.
Reproductive effects	No data available.
Teratogenicity	No data available.
Further information	No other specific acute or chronic health impact noted.

12. Ecological Information

Ecotoxicity	The product is a volatile organic compound which has a photochemical ozone creation potential.
Aquatic toxicity	Not expected to be harmful to aquatic organisms.
Persistence and degradability	The product is easily biodegradable.
Bioaccumulation / Accumulation	The product is not bioaccumulating.
Mobility in environmental media	The product is a volatile substance, which may spread in the atmosphere.
Partition coefficient (n-octanol/water)	No data available.

13. Disposal Considerations

Waste codes D001:	Waste Flammable material with a flash point <140 °F
Disposal instructions	This safety data sheet concerns non-containerized natural gas that is delivered by pipeline from a Southwest Gas meter. See Section 16 for more information. Do not dispose of waste into sewer. This product, in its unaltered state, when discarded or disposed of, is not a hazardous waste according to Federal regulations (40 CFR 261.4(b)(4)). Under RCRA, it is the responsibility of the user of the product to determine, at the time of disposal, whether the product meets RCRA criteria for hazardous waste.

14. Transport Information

DOT	This safety data sheet concerns non-containerized natural gas that is delivered by pipeline from a Southwest Gas meter. Re-transportation of natural gas by pipeline may be governed by 49 CFR Part 192 and applicable pipeline safety codes.
Basic shipping requirements	If this product is placed into a pressurized container and offered for shipment, refer to 49 CFR, Parts 171 to 185, for appropriate regulatory information. See Section 16.

15. Regulatory Information

US federal regulations	This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200. Some components are on the U.S. EPA TSCA Inventory List.

US TSCA Section 12(b) Export Notification: Export Notification requirement / De minimis concentration

Pentane (CAS 109-66-0)	1.0 % One-Time Export Notification only.

Natural gas reporting requirements are contained in 40 CFR Part 311, 40 CFR Part 370, and 40 CFR Part 372 for industrial users of natural gas and for government employees of hazardous waste operations. Southwest Gas has not attempted to assess the applicability of these regulations to the unique operating characteristics of the applicable employers

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Section 302 extremely hazardous substance	No
Section 311 hazardous chemical	Yes

State regulations California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65) Warning: By-products of the incomplete combustion of natural gas are known to the State of California to cause cancer, birth defects or other reproductive harm.

US - California Hazardous Substances (Director's): Listed substance

Carbon Monoxide (CAS 630-08-0)	Listed.
Formaldehyde (CAS 50-00-0)	Listed.
Soot	Listed.

16. Other Information

Containerized natural gas and LNG This safety data sheet concerns non-containerized natural gas that is delivered by pipeline from a Southwest Gas meter. **Containerized natural gas** and **liquefied natural gas** have their own unique hazards that are not provided for in this material safety data sheet. For example, those products require substantially different and specialized engineering controls, safe handling precautions, personal protective equipment, accidental release measures, fire fighting measures, transportation requirements, and product labeling requirements.

Odorant added by Southwest Gas This safety data sheet is for natural gas that is odorized by Southwest Gas. Some natural gas transported by Southwest Gas is already odorized from upstream distributors and may contain different odorant blends than those used by Southwest Gas. Please contact Southwest Gas for more information about the source of the natural gas for any particular location. Some downstream users may remove the odorant from the natural gas supplied by Southwest Gas, or may add similar or different odorant blends.

HMIS® ratings
Health: 1*
Flammability: 4
Physical hazard: 0
(HMIS® is a registered trade and service mark of the NPCA.)

NFPA ratings
Health: 1
Flammability: 4
Instability: 0

Definitions

Air-ejector A device that uses the Venturi principle to siphon air or other gases. Compressed air or pressurized inert gas is introduced to allow the pressure at the throat to drop below atmospheric pressure, allowing air or other gases at atmospheric pressure to flow into the throat.

Fire-watch The assignment of a person or persons to an area for the express purpose of notifying the fire department, the building occupants, or both of an emergency; preventing a fire from occurring; extinguishing small fires; or protecting the public from fire or life safety dangers.

Hot-work Work or operations capable of providing a source of ignition. Includes, but is not limited to: burning, heating, thermal spraying, thawing pipe, torch-applied roofing, or other work involving open flames; sparking of electrical equipment; and cutting, welding, grinding, riveting, buffing, drilling, blasting, chipping, scraping, sawing, brazing, soldering, or other similar operations that create hot metal, sparks, or hot surfaces from friction or impact.

Retrieval-system Combinations of rescue equipment used for nonentry (external) rescue of persons from hazardous environments or confined spaces.

Disclaimer	This product has not been tested by Southwest Gas to determine its specific health hazards. Therefore, the information in this safety data sheet may be incomplete. The information includes health hazard information on the product components that was drawn from external sources. All information is provided without warranty, express or implied. The information is believed to be correct: if errors are discovered, please promptly report them to Southwest Gas. All information contained in this safety data sheet is provided to allow the user to make an independent determination of the methods required to safeguard workers, the public and the environment. This document is not intended to convey legal advice: users should consult all applicable building and construction codes, occupational and process safety codes, environmental regulations, and all other applicable ordinances, rules, codes, regulations, statutes or other law that may include different or more stringent provisions. No effort is made to identify any transportation, environmental, or other regulatory requirements beyond the states of Arizona, California, and Nevada.
Notice of future revisions	Notices of revision to this safety data sheet will be provided in customer bill inserts and in messages on the front of the customer bill. Request a current version of this safety data sheet by contacting Southwest Gas (Section 1) or by visiting www.swgas.com.
Original issue date	02-26-2010
History of revisions	The prior version was dated 03-17-2010.

ATTACHMENT I: EMISSION UNITS TABLE

Attachment I

Emission Units Table

(includes all emission units and air pollution control devices that will be part of this permit application review, regardless of permitting status)

Emission Unit ID	Emission Point ID	Emission Unit Description	Year Installed/ Modified	Design Capacity[4]	Type and Date of Change	Control Device
S1A S1B S1C	E2A E2B E2C	Pre-Reformer	Upon Permit	N/A	New	NA
S2A S2B S2C	E1A E1B E1C	Steam Methane Reformer (SMR)	Upon Permit	362 tpd MeOH per unit A, B, and C	New	C1A C1B C1C
S3A S3B S3C	E2A E2B E2C	Methanol Synthesis[1]	Upon Permit	362 tpd MeOH per unit A, B, and C	New	C2A C2B C2C
S4A S4B S4C	E2A E2B E2C	Distillation and Refining Columns	Upon Permit	362 tpd MeOH per unit A, B, and C	New	C2A C2B C2C
S5A S5B S5C	E2A E2B E2C	Flare	Upon Permit	N/A	New	C2A C2B C2C
S6T1 S6T2 S6T3 S6T4 S6T5 S6T6 S6T7 S6T8 S6T9	E1A E1B E1C	Methanol Storage	Upon Permit	375,000 gal 375,000 gal 375,000 gal 375,000 gal 375,000 gal 375,000 gal 375,000 gal 375,000 gal 375,000 gal	New	VB-O[2] VB-O[2] VB-O[2] VB-O[2] VB-O[2] VB-O[2] VB-O[2] VB-O[2] VB-O[2]
S7LT1 S7LT2	E1A E1B E1C	Methanol Loading[2] – Truck Tanks	Upon Permit	800 gal/min per pump	New	VB-O[2] VB-O[2] VB-O[2]
S7LR1 S7LR2	E1A E1B E1C	Methanol Loading[2] – Rail Tank Cars	Upon Permit	800 gal/min per pump	New	VB-O[2] VB-O[2] VB-O[2]
S7PLB	E1A E1B E1C	Methanol Loading[2] – Barge	Upon Permit	1,500 gal/min with spare	New	VB-O[2] VB-O[2] VB-O[2]
SG1 SG2 SG3 SG4 SG5 SG6 SG7	E3G1 E3G2 E3G3 E3G4 E3G5 E3G6 E3G7	Power Plant[3]	Upon Permit	5,500 bhp 5,500 bhp 5,500 bhp 5,500 bhp 5,500 bhp 5,500 bhp	New	C3G1 C3G2 C3G3 C3G4 C3G5 C3G6 C3G7

[1] During normal operation methanol synthesis recycle loop feeds the purge gas to the SMR burners and its flue gas is subsequently treated by a SCR/oxidation catalyst. During startup, shutdown, and maintenance events, gases are purged to the flare during the event.
[2] Methanol storage tanks and methanol unloading utilize vapor balance systems. Excess vapors, if present. are routed to SMR burners and offset any natural gas or purge gas emissions, therefore present no net emissions. This is listed as VB-O to represent the vapor balance system and the other to indicate the SMR.
[3] Power plant consists of seven CAT CG260-16 rated at 4000 kWelec (4102 kW engine mechanical power, 5499 bhp) with each engine exhausting to a dedicated SCR/oxidation catalyst and stack.
[4] Design capacities are nominal and depend on the ambient conditions and final design.

ATTACHMENT J: EMISSION POINTS DATA SUMMARY SHEET

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 1: Emissions Data

Emission Point ID No. *(Must match Emission Units Table & Plot Plan)*	Emission Point Type[1]	Emission Unit Vented Through This Point *(Must match Emission Units Table & Plot Plan)*		Air Pollution Control Device *(Must match Emission Units Table & Plot Plan)*		Vent Time for Emission Unit *(chemical processes only)*		All Regulated Pollutants - Chemical Name/CAS[3] *(Speciate VOCs & HAPS)*	Maximum Potential Uncontrolled Emissions [4]		Maximum Potential Controlled Emissions [5]		Emission Form or Phase *(At exit conditions, Solid, Liquid or Gas/Vapor)*	Est. Method Used [6]	Emission Concentration [7] (ppmv or mg/m^3)
		ID No.	Source	ID No.	Device Type	Short Term[2]	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
E1A		S2A		C1A		NA	NA	NOX	30.6	134.2	3.03	13.42	Gas	EE	8 ppmv
								CO	3.40	14.91	1.84	8.23			8 ppmv
E1B	Upward	S2B	SMR	C1B	SCR			VOC	1.04	4.57	1.04	4.57			See
	Vertical				Oxy-Cat			PM/PM10/PM2.5	1.02	4.48	1.02	4.48			Attachment
E1C	Stack	S2C		C1B				SO2	0.14	0.61	0.14	0.61			N[8]
								HAP	0.12	0.52	0.12	0.52			
E2A	Upward	S1A, S3A S4A, S5A		C2A		NA	NA	NOX				1.28	Gas	EE	See
	Vertical		PREFR					CO				9.48			Attachment
E2B	Stack	S1B, S3B S4B, S5B	MEOH SYNTH	C2B	Flare			VOC				0.17			N[9]
								PM/PM10/PM2.5				0.32			
			DIST					SO2				0.00			
E2C		S1C, S3C S4C, S5C		C2C				HAP				0.11			
E3G1 E3G2 E3G3 E3G4 E3G5 E3G6 E3G7	Upward	SG1 SG2 SG3 SG4 SG5 SG6 SG7		C3G1 C3G2 C3G3 C3G4 C3G5 C3G6 C3G7		NA	NA	NOX	11.39	49.89	1.60	6.98	Gas	EE	See
	Vertical		RICE					CO	15.54	68.05	1.258	5.51			Attachment
	Stack				SCR			VOC	1.916	8.39	0.958	4.20			N
					Oxy-Cat			PM/PM10/PM2.5	0.114	0.50	0.114	0.50			
								SO2	0.02	0.087	0.02	0.087			
								HAP	3.98	17.43	0.513	2.25			
								Formaldehyde	3.28	14.37	0.266	1.16			

The EMISSION POINTS DATA SUMMARY SHEET provides a summation of emissions by emission unit. Note that uncaptured process emission unit emissions are not typically considered to be fugitive and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET. Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions). Please complete the FUGITIVE EMISSIONS DATA SUMMARY SHEET for fugitive emission activities.

1 Please add descriptors such as upward vertical stack, downward vertical stack, horizontal stack, relief vent, rain cap, etc.

2 Indicate by "C" if venting is continuous. Otherwise, specify the average short-term venting rate with units, for intermittent venting (ie., 15 min/hr). Indicate as many rates as needed to clarify frequency of venting (e.g., 5 min/day, 2 days/wk).

3 List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. **LIST** Acids, CO, CS_2, VOCs, H_2S, Inorganics, Lead, Organics, O_3, NO, NO_2, SO_2, SO_3, all applicable Greenhouse Gases (including CO_2 and methane), etc. **DO NOT LIST** H_2, H_2O, N_2, O_2, and Noble Gases.

4 Give maximum potential emission rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch). Maximum emissions per constituent are from its associated worst case see detailed calculations in Attachment N. Emissions are on a per unit basis. Therefore to obtain entire plant emissions multiple by number of units (3 for first two rows and 7 for last row).

5 Give maximum potential emission rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch). Maximum emissions per constituent are from its associated worst case see detailed calculations in Attachment N. Emissions are on a per unit basis. Therefore to obtain entire plant emissions multiple by number of units (3 for first two rows and 7 for last row).

6 Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

7 Provide for all pollutant emissions. Typically, the units of parts per million by volume (ppmv) are used. If the emission is a mineral acid (sulfuric, nitric, hydrochloric or phosphoric) use units of milligram per dry cubic meter (mg/m^3) at standard conditions (68 °F and 29.92 inches Hg) (see 45CSR7). If the pollutant is SO_2, use units of ppmv (See 45CSR10).

8 Values shown are for normal operations and do not include SSM events.

9 Only total values are shown as they are made of combinations of different SSM events that have different durations and releases. Within each event the admissions vary over time. Therefore, refer to Attachment N for the detailed uncontrolled emissions and maximum hourly emissions.

Attachment J
EMISSION POINTS DATA SUMMARY SHEET

Table 2: Release Parameter Data								
Emission Point ID No. *(Must match Emission Units Table)*	Inner Diameter (ft.)	Exit Gas			Emission Point Elevation (ft)		UTM Coordinates (km)	
		Temp. (ºF)	Volumetric Flow [1] (acfm) *at operating conditions*	Velocity (fps)	Ground Level *(Height above mean sea level)*	Stack Height [2] *(Release height of emissions above ground level)*	Northing	Easting
E1A	TBD	280	NA	NA	607	195*	4354.3808	469.4870
E1B	TBD	280	NA	NA	607	195*	4354.4087	469.5750
E1C	TBD	280	NA	NA	607	195*	4354.4365	469.6621
E2A	TBD	100 - 500	NA	NA	607	195*	4354.3808	469.4870
E2B	TBD	100 – 500	NA	NA	607	195*	4354.4087	469.5750
E2C	TBD	100 - 500	NA	NA	607	195*	4354.4365	469.6621
E3G1	TBD	853	NA	NA	607	TBD	4354.2707	469.4181
E3G2	TBD	853	NA	NA	607	TBD	4354.2726	469.4239
E3G3	TBD	853	NA	NA	607	TBD	4354.2744	469.4297
E3G4	TBD	853	NA	NA	607	TBD	4354.2763	469.4355
E3G5	TBD	853	NA	NA	607	TBD	4354.2782	469.4128
E3G6	TBD	853	NA	NA	607	TBD	4354.2800	469.4471
E3G7	TBD	853	NA	NA	607	TBD	4354.2819	469.4529

[1] Give at operating conditions. Include inerts.
[2] Release height of emissions above ground level.
*Value is preliminary stack height will be greater than 175 feet.

ATTACHMENT K: FUGITIVE EMISSIONS DATA SUMMARY SHEET

Attachment K

FUGITIVE EMISSIONS DATA SUMMARY SHEET

The FUGITIVE EMISSIONS SUMMARY SHEET provides a summation of fugitive emissions. Fugitive emissions are those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening. Note that uncaptured process emissions are not typically considered to be fugitive, and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET.

Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions).

APPLICATION FORMS CHECKLIST - FUGITIVE EMISSIONS
1.) Will there be haul road activities? ☒ Yes ☐ No See Attachment N For Detailed calculations ☐ If YES, then complete the HAUL ROAD EMISSIONS UNIT DATA SHEET.
2.) Will there be Storage Piles? ☐ Yes ☒ No ☐ If YES, complete Table 1 of the NONMETALLIC MINERALS PROCESSING EMISSIONS UNIT DATA SHEET.
3.) Will there be Liquid Loading/Unloading Operations? ☒ Yes ☐ No ☒ If YES, complete the BULK LIQUID TRANSFER OPERATIONS EMISSIONS UNIT DATA SHEET.
4.) Will there be emissions of air pollutants from Wastewater Treatment Evaporation? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
5.) Will there be Equipment Leaks (e.g. leaks from pumps, compressors, in-line process valves, pressure relief devices, open-ended valves, sampling connections, flanges, agitators, cooling towers, etc.)? ☒ Yes ☐ No See Attachment N for Detailed Calculations ☐ If YES, complete the LEAK SOURCE DATA SHEET section of the CHEMICAL PROCESSES EMISSIONS UNIT DATA SHEET.
6.) Will there be General Clean-up VOC Operations? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.
7.) Will there be any other activities that generate fugitive emissions? ☐ Yes ☒ No ☐ If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET or the most appropriate form.
If you answered “NO” to all of the items above, it is not necessary to complete the following table, “Fugitive Emissions Summary.”

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants - Chemical Name/CAS[1]	Maximum Potential Uncontrolled Emissions[2]		Maximum Potential Controlled Emissions[3]		Est. Method Used[4]
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads	PM/PM10/PM2.5	0.27/0.05/0.01	1.2/0.24/0.06	0.27/0.05/0.01	1.2/0.24/0.06	AP-42
Unpaved Haul Roads						
Storage Pile Emissions						
Loading/Unloading Operations	See Attachment J (no emissions w/ vapor balance system	0	0	0	0	EE
Wastewater Treatment Evaporation & Operations						
Equipment Leaks	VOC HAP Methanol CO	Does not apply	10.4 10.2 10.2 0.06	Does not apply	5.8 5.8 5.8 0.06	EE
General Clean-up VOC Emissions						
Other						

[1] List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS_2, VOCs, H_2S, Inorganics, Lead, Organics, O_3, NO, NO_2, SO_2, SO_3, all applicable Greenhouse Gases (including CO_2 and methane), etc. DO NOT LIST H_2, H_2O, N_2, O_2, and Noble Gases.
[2] Give rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).
[3] Give rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).
[4] Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

ATTACHMENT L: EMISSIONS UNIT DATA SHEETS

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): S1A, S1B, S1C

1. Name or type and model of proposed affected source: Each unit has a Pre-Refomer section that includes feed preheaters, a hydrogenerator/sulfur absorber unit and a pre-reformer vessel.
2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.
3. Name(s) and maximum amount of proposed process material(s) charged per hour: Natural gas and water
4. Name(s) and maximum amount of proposed material(s) produced per hour: Each unit produces prereformer syngas with a nominal methanol production capacity of 362 tons per day.
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: Pre-Reformer section converts the higher hydrocarbons in the pipeline natural gas to methane, hydrogen, carbon monoxide, and carbon dioxide in preparation for SMR feed. The desulfurization system removes sulfur-containing compounds from the pipeline-grade natural gas feeding the pre-reformer. This source does not have point source emissions, during non normal operations gases may be directed to the flare and this is addressed in the Flare Emissions Summary Unit Data sheet. Fugitive emissions are accounted for in Attachment K: Fugitive Emissions Data Summary.

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable):		
(a) Type and amount in appropriate units of fuel(s) to be burned:		
(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:		
(c) Theoretical combustion air requirement (ACF/unit of fuel): @ °F and psia.		
(d) Percent excess air:		
(e) Type and BTU/hr of burners and all other firing equipment planned to be used:		
(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:		
(g) Proposed maximum design heat input: $\times 10^6$ BTU/hr.		
7. Projected operating schedule:		
Hours/Day 24	Days/Week 7	Weeks/Year 52

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@ °F and psia

a.	NO_X	NA lb/hr	grains/ACF
b.	SO_2	NA lb/hr	grains/ACF
c.	CO	NA lb/hr	grains/ACF
d.	PM_{10}	NA lb/hr	grains/ACF
e.	Hydrocarbons	NA lb/hr	grains/ACF
f.	VOCs	NA lb/hr	grains/ACF
g.	Pb	NA lb/hr	grains/ACF
h.	Specify other(s)		
		lb/hr	grains/ACF
		lb/hr	grains/ACF
		lb/hr	grains/ACF
		lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing

Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
REPORTING	TESTING

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

Each Pre-Reformer section will be operated and maintained in accordance with the design and the plant's Operating and Maintenance procedures.

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): S2A, S2B, S2C

1. Name or type and model of proposed affected source: Each Steam Methane Reformer (SMR) unit includes a Haldor Topsoe Convection Reformer (HTCR), burner, duct burners, waste heat boilers, reboilers, deaerator, pumps, compressors, separators, coolers, and blowers.
2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.
3. Name(s) and maximum amount of proposed process material(s) charged per hour: Pipeline natural gas (PNG) that has been treated by Pre-Reformer and water
4. Name(s) and maximum amount of proposed material(s) produced per hour: Each unit produces syngas with a methanol production capacity of 362 tons per day.
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: Natural gas reforming to syngas with composition on a dry volume basis of over 70% hydrogen and remaining gas consists CO, methane, CO_2, nitrogen, and water. The process produces a purge gas with nominal composition of 70 to 76% hydrogen, 19 to 25% methane, with remaining gas being CO, CO_2, methanol, nitrogen, and water.

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable):

(a) Type and amount in appropriate units of fuel(s) to be burned:

Fuel for each unit in normal operation (NO) is purge gas with nominally 462 Btu/scf HHV gas. The process design flow rates for NO are 406,475 scfh for main burner (MB) and 50,289 scfh for duct burners (DB). During startup PNG with a lean value of 1084 Btu/scf HHV is used. With PNG the estimated flow rates can normallly be as high as 178,000 scfh for MB and for the DB 53,500 scfh.

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

PNG is used for startup. The natural gas will not be more than one quarter (1/4) grain of hydrogen sulfide per one hundred cubic feet and not more than twenty grains total sulfur or sulfur compounds per one hundred feet. For normal operation process (purge) gas is used as fuel. The H2S will be below 50 grains per 100 hundred cubic feet and is expected to be below 100 ppbv.

(c) Theoretical combustion air requirement (ACF/unit of fuel):

@ °F and psia.

(d) Percent excess air: 10% or greater

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

Maximum Design Heat Input in NO (purge gas) - SMR is 232.13 MMBtu/h with Main Burner = 206.57 MMBtu/h HHV and Duct Burner = 25.56 MMBtu/h. The heating value is 462 Btu/scf HHV and flow rates are 10 percent higher than the process design rates.
Maximum Design Hest Input in SSM cases when on PNG - Main Burner is 212 MMBtu/h HHV and 64 MMBtu/h HHV burner for a duct burners when firing 1084 Btu/scf HHV PNG. Burners are equipped with UV flame detection device.

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

(g) Proposed maximum design heat input: See e above $\times 10^6$ BTU/hr.

7. Projected operating schedule:

Hours/Day	24	Days/Week	7	Weeks/Year	52

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@ °F and psia

a.	NO_X	See Attachment N lb/hr	grains/ACF
b.	SO_2	See Attachment N lb/hr	grains/ACF
c.	CO	See Attachment N lb/hr	grains/ACF
d.	PM_{10}	See Attachment N lb/hr	grains/ACF
e.	Hydrocarbons	See Attachment N lb/hr	grains/ACF
f.	VOCs	See Attachment N lb/hr	grains/ACF
g.	Pb	See Attachment N lb/hr	grains/ACF
h.	Specify other(s)		
	See Attachment N	lb/hr	grains/ACF
		lb/hr	grains/ACF
		lb/hr	grains/ACF
		lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
Monitor opacity and visible emissions from emissions point. The SMR stacks will have a CEMS unit to monitor NOx and CO. Additionally, the units will have PEMS to track and record SMR flue gas emisssions based on simulated data (Appendix N), measured process parameters as input variables, and duration of events.	Maintain record of opacity and visible emissions. Maintain logs of NOx and CO. Track and record SSM events using the PEM to record SMR emissions.
REPORTING	**TESTING**
None proposed.	Stack testing of CO and NOx to be completed within 180 days after startup. CEMS calibration to be completed within 180 days after startup. Results will be provided to the WV Division of Air Quality. Perform periodic QA testing on CEMS.

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

The SMR will be operated and maintained in accordance with the design and the plant's Operating and Maintenance procedures.

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): S3A, S3B, S3C

1. Name or type and model of proposed affected source: Each unit has a methanol synthesis section that includes a methanol reactor, pumps, compressors, coolers, seperators, and steam generators.
2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.
3. Name(s) and maximum amount of proposed process material(s) charged per hour: Syngas
4. Name(s) and maximum amount of proposed material(s) produced per hour: Each methanol synthesis unit supports methanol production capacity of 362 tons per day.
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: A cooled tubular reactor is used to react hydrogen with the carbon monoxide and carbon dioxide in the synthesis gas to produce methanol. Water is a byproduct. The gas-phase exothermic reactions are conducted in a packed tubular reactor, which is cooled by generating steam.This source does not have point source emissions, during non normal operations venting is directed to the flare and addressed in the Flare Emissions Summary Unit Data sheet. Fugitive emissions are accounted for in Attachment K: Fugitive Emissions Data Summary.

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable):

(a) Type and amount in appropriate units of fuel(s) to be burned:

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

(c) Theoretical combustion air requirement (ACF/unit of fuel):

@ °F and psia.

(d) Percent excess air:

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

(g) Proposed maximum design heat input: $\times 10^6$ BTU/hr.

7. Projected operating schedule:

Hours/Day	24	Days/Week	7	Weeks/Year	52

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@ °F and psia

a.	NO_X	NA lb/hr	grains/ACF
b.	SO_2	NA lb/hr	grains/ACF
c.	CO	NA lb/hr	grains/ACF
d.	PM_{10}	NA lb/hr	grains/ACF
e.	Hydrocarbons	NA lb/hr	grains/ACF
f.	VOCs	NA lb/hr	grains/ACF
g.	Pb	NA lb/hr	grains/ACF
h.	Specify other(s)		
		lb/hr	grains/ACF
		lb/hr	grains/ACF
		lb/hr	grains/ACF
		lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
REPORTING	TESTING

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

Each Methanol Synthesis Section will be operated and maintained in accordance with the design and the plant's Operating and Maintenance procedures.

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): S4A, S4B, S4C

1. Name or type and model of proposed affected source: Each unit has a methanol distillation system consists of a series of distillation columns that purify the crude methanol to IMPCA-specification methanol and purify the byproduct water to where it can be recycled in the processs. The system inclues columns, tanks, pumps, reboilers, accumulators, strippers, condensers, and coolers .
2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.
3. Name(s) and maximum amount of proposed process material(s) charged per hour: Raw methanol and water
4. Name(s) and maximum amount of proposed material(s) produced per hour: Each methanol dsitillation system unit supports a nominal methanol production capacity of 362 tons per day.
5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants: Distillation columns purify the crude methanol to IMPCA-specification methanol and purify the byproduct water to a quality where it can be recycled in the processs. This source does not have point source emissions, during non normal operations venting is directed to the flare and addressed in the Flare Emissions Summary Unit Data sheet. Fugitive emissions are accounted for in Attachment K: Fugitive Emissions Data Summary.

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable):

(a) Type and amount in appropriate units of fuel(s) to be burned:

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

(c) Theoretical combustion air requirement (ACF/unit of fuel):

@ °F and psia.

(d) Percent excess air:

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

(g) Proposed maximum design heat input: $\times 10^6$ BTU/hr.

7. Projected operating schedule:

Hours/Day	24	Days/Week	7	Weeks/Year	52

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used: @ °F and psia		
a. NO_X	NA lb/hr	grains/ACF
b. SO_2	NA lb/hr	grains/ACF
c. CO	NA lb/hr	grains/ACF
d. PM_{10}	NA lb/hr	grains/ACF
e. Hydrocarbons	NA lb/hr	grains/ACF
f. VOCs	NA lb/hr	grains/ACF
g. Pb	NA lb/hr	grains/ACF
h. Specify other(s)		
	lb/hr	grains/ACF
	lb/hr	grains/ACF
	lb/hr	grains/ACF
	lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
REPORTING	TESTING

MONITORING. Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment operation/air pollution control device.

RECORDKEEPING. Please describe the proposed recordkeeping that will accompany the monitoring.

REPORTING. Please describe the proposed frequency of reporting of the recordkeeping.

TESTING. Please describe any proposed emissions testing for this process equipment/air pollution control device.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

Each Methanol Distillation System will be operated and maintained in accordance with the design and the plant's Operating and Maintenance procedures.

Attachment L
EMISSIONS UNIT DATA SHEET
GENERAL

To be used for affected sources other than asphalt plants, foundries, incinerators, indirect heat exchangers, and quarries.

Identification Number (as assigned on *Equipment List Form*): S5A, S5B, S5C

1. Name or type and model of proposed affected source:

   Each methanol unit is equipped with a dual flare with a High Pressure (HP) flare section and a Low Pressure (LP) flare section. There is a natural gas fueled pilot that serves the HP and LP sections. The HP flare section is utilized during startup, shutdown, and maintenance (SSM) events and is sometimes referred to as the SSM flare. The LP flare section is available to handle small equipment leaks (fugitive and between repair leaks). Additional informaton on flare is provided in Attachment M, Air Pollution Control Device for Flare System.

2. On a separate sheet(s), furnish a sketch(es) of this affected source. If a modification is to be made to this source, clearly indicated the change(s). Provide a narrative description of all features of the affected source which may affect the production of air pollutants.

3. Name(s) and maximum amount of proposed process material(s) charged per hour:

   LP flare section serves as the control device for equipment leaks. Tyically, there are no equipment leaks. When there is an equipment leak, the leaked gases go to the LP flare section. Leaks occur when there is an equipment or component issue and occurs until a repair is made or the equipment or component is isolated and taken out of service.

   HP flare section has no gases during normal operation. During startup, shutdown, or trip situations natural gas or process syngas is routed to the flare. The HP/LP flare has six pilot burners to keep the flare lit.

4. Name(s) and maximum amount of proposed material(s) produced per hour:

   The primary effluents from the flare are CO_2, nitrogen, water vapor, and oxyen (See Attachment N for details).

5. Give chemical reactions, if applicable, that will be involved in the generation of air pollutants:

   The flare treats the gases via a combustion process. Generally, carbon is converted to CO_2 and Hydrogen is converted to water.

* The identification number which appears here must correspond to the air pollution control device identification number appearing on the *List Form*.

6. Combustion Data (if applicable):

(a) Type and amount in appropriate units of fuel(s) to be burned:

HP section will process natural gas with a nominal heating value of 1084 Btu/scf and process (purge) gas with a nominal heating of 462 Btu/scf. (See See Attachment N for additional information.)

(b) Chemical analysis of proposed fuel(s), excluding coal, including maximum percent sulfur and ash:

Natural gas: 88.86% methane, Ethane 10.54%, Propane 0.06%, Nitrogen 0.338%, and Carbon Dioxide 0.16%. The process/purge gas with nominal composition of 70 to 76% hydrogen, 19 to 25% methane, with remaining gas being CO, CO2, methanol, nitrogen, and water.

(c) Theoretical combustion air requirement (ACF/unit of fuel):

@ °F and psia.

(d) Percent excess air: 10%

(e) Type and BTU/hr of burners and all other firing equipment planned to be used:

(f) If coal is proposed as a source of fuel, identify supplier and seams and give sizing of the coal as it will be fired:

(g) Proposed maximum design heat input: $\times 10^6$ BTU/hr.

7. Projected operating schedule:

Hours/Day	24	Days/Week	7	Weeks/Year	52

8. Projected amount of pollutants that would be emitted from this affected source if no control devices were used:

@ °F and psia

a.	NO_X	See Attachment N lb/hr	grains/ACF
b.	SO_2	See Attachment N lb/hr	grains/ACF
c.	CO	See Attachment N lb/hr	grains/ACF
d.	PM_{10}	See Attachment N lb/hr	grains/ACF
e.	Hydrocarbons	See Attachment N lb/hr	grains/ACF
f.	VOCs	See Attachment N lb/hr	grains/ACF
g.	Pb	See Attachment N lb/hr	grains/ACF
h.	Specify other(s)		
		lb/hr	grains/ACF
		lb/hr	grains/ACF
		lb/hr	grains/ACF
		lb/hr	grains/ACF

NOTE: (1) An Air Pollution Control Device Sheet must be completed for any air pollution device(s) used to control emissions from this affected source.

(2) Complete the Emission Points Data Sheet.

9. Proposed Monitoring, Recordkeeping, Reporting, and Testing
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
See Attachment M, Air Pollution Control Device for Flare System.	See Attachment M, Air Pollution Control Device for Flare System.
REPORTING	**TESTING**
See Attachment M, Air Pollution Control Device for Flare System.	See Attachment M, Air Pollution Control Device for Flare System.

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty
See Attachment M, Air Pollution Control Device for Flare System.

Attachment L
EMISSIONS UNIT DATA SHEET
STORAGE TANKS

Provide the following information for each new or modified bulk liquid storage tank as shown on the *Equipment List Form* and other parts of this application. A tank is considered modified if the material to be stored in the tank is different from the existing stored liquid.

IF USING US EPA'S TANKS EMISSION ESTIMATION PROGRAM (AVAILABLE AT **www.epa.gov/tnn/tanks.html**), APPLICANT MAY ATTACH THE SUMMARY SHEETS IN LIEU OF COMPLETING SECTIONS III, IV, & V OF THIS FORM. HOWEVER, SECTIONS I, II, AND VI OF THIS FORM MUST BE COMPLETED. US EPA'S AP-42, SECTION 7.1, "ORGANIC LIQUID STORAGE TANKS," MAY ALSO BE USED TO ESTIMATE VOC AND HAP EMISSIONS (**http://www.epa.gov/tnn/chief/**).

I. GENERAL INFORMATION (required)

1. Bulk Storage Area Name Methanol Storage	2. Tank Name Methanol Storage Tans 1 through 9,
3. Tank Equipment Identification No. (as assigned on *Equipment List Form*) S6T1, S6T2, …, S6T9	4. Emission Point Identification No. (as assigned on *Equipment List Form*) VAPOR BALANCED NO NET EMISSIONS
5. Date of Commencement of Construction (for existing tanks)	
6. Type of change ☒ New Construction ☐ New Stored Material ☐ Other Tank Modification	
7. Description of Tank Modification (if applicable)	
7A. Does the tank have more than one mode of operation? (e.g. Is there more than one product stored in the tank?) ☐ Yes ☒ No	
7B. If YES, explain and identify which mode is covered by this application (Note: A separate form must be completed for each mode).	
7C. Provide any limitations on source operation affecting emissions, any work practice standards (e.g. production variation, etc.):	

II. TANK INFORMATION (required)

8. Design Capacity (specify barrels or gallons). Use the internal cross-sectional area multiplied by internal height. 375,000 gallons	
9A. Tank Internal Diameter (ft) 40	9B. Tank Internal Height (or Length) (ft) 40
10A. Maximum Liquid Height (ft)	10B. Average Liquid Height (ft)
11A. Maximum Vapor Space Height (ft)	11B. Average Vapor Space Height (ft)
12. Nominal Capacity (specify barrels or gallons). This is also known as "working volume" and considers design liquid levels and overflow valve heights. 320,000 gallons	

13A. Maximum annual throughput (gal/yr) 15,000,000 (average tank)	13B. Maximum daily throughput (gal/day) 41,096 (average tank)
14. Number of Turnovers per year (annual net throughput/maximum tank liquid volume) 43 (average tank)	
15. Maximum tank fill rate (gal/min) 450	
16. Tank fill method ☐ Submerged ☐ Splash ☐ Bottom Loading	
17. Complete 17A and 17B for Variable Vapor Space Tank Systems ☒ Does Not Apply	
17A. Volume Expansion Capacity of System (gal)	17B. Number of transfers into system per year

18. Type of tank (check all that apply):

☒ Fixed Roof x vertical ___ horizontal ___ flat roof ___ cone roof ___ dome roof
___ other (describe)

☐ External Floating Roof ___ pontoon roof ___ double deck roof

☐ Domed External (or Covered) Floating Roof

☐ Internal Floating Roof ___ vertical column support ___ self-supporting

☐ Variable Vapor Space ___ lifter roof ___ diaphragm

☒ Pressurized ___ spherical X cylindrical

☐ Underground

☐ Other (describe)

III. TANK CONSTRUCTION & OPERATION INFORMATION (optional if providing TANKS Summary Sheets)

19. Tank Shell Construction: ☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☒ Other (describe) welded		
20A. Shell Color SS	20B. Roof Color SS	20C. Year Last Painted
21. Shell Condition (if metal and unlined): ☐ No Rust ☐ Light Rust ☐ Dense Rust ☒ Not applicable		
22A. Is the tank heated? ☐ YES ☒ NO		
22B. If YES, provide the operating temperature (°F)		
22C. If YES, please describe how heat is provided to tank.		
23. Operating Pressure Range (psig): <0 to 6		
24. Complete the following section for **Vertical Fixed Roof Tanks** ☐ Does Not Apply		
24A. For dome roof, provide roof radius (ft) TBD		
24B. For cone roof, provide slope (ft/ft)		
25. Complete the following section for **Floating Roof Tanks** ☒ Does Not Apply		
25A. Year Internal Floaters Installed:		
25B. Primary Seal Type: (check one) ☐ Metallic (Mechanical) Shoe Seal ☐ Liquid Mounted Resilient Seal ☐ Vapor Mounted Resilient Seal ☐ Other (describe):		
25C. Is the Floating Roof equipped with a Secondary Seal? ☐ YES ☐ NO		
25D. If YES, how is the secondary seal mounted? (check one) ☐ Shoe ☐ Rim ☐ Other (describe):		
25E. Is the Floating Roof equipped with a weather shield? ☐ YES ☐ NO		

25F. Describe deck fittings; indicate the number of each type of fitting:		
ACCESS HATCH		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
AUTOMATIC GAUGE FLOAT WELL		
BOLT COVER, GASKETED:	UNBOLTED COVER, GASKETED:	UNBOLTED COVER, UNGASKETED:
COLUMN WELL		
BUILT-UP COLUMN – SLIDING COVER, GASKETED:	BUILT-UP COLUMN – SLIDING COVER, UNGASKETED:	PIPE COLUMN – FLEXIBLE FABRIC SLEEVE SEAL:
LADDER WELL		
PIP COLUMN – SLIDING COVER, GASKETED:	PIPE COLUMN – SLIDING COVER, UNGASKETED:	
GAUGE-HATCH/SAMPLE PORT		
SLIDING COVER, GASKETED:	SLIDING COVER, UNGASKETED:	
ROOF LEG OR HANGER WELL		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	SAMPLE WELL-SLIT FABRIC SEAL (10% OPEN AREA)
VACUUM BREAKER		
WEIGHTED MECHANICAL ACTUATION, GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
RIM VENT		
WEIGHTED MECHANICAL ACTUATION GASKETED:	WEIGHTED MECHANICAL ACTUATION, UNGASKETED:	
DECK DRAIN (3-INCH DIAMETER)		
OPEN:	90% CLOSED:	
STUB DRAIN		
1-INCH DIAMETER:		
OTHER (DESCRIBE, ATTACH ADDITIONAL PAGES IF NECESSARY)		
See API Standard 620 Storage Tank Data Sheet in Attachment N.		

26. Complete the following section for Internal Floating Roof Tanks ☒ Does Not Apply	
26A. Deck Type: ☐ Bolted ☐ Welded	
26B. For Bolted decks, provide deck construction:	
26C. Deck seam: ☐ Continuous sheet construction 5 feet wide ☐ Continuous sheet construction 6 feet wide ☐ Continuous sheet construction 7 feet wide ☐ Continuous sheet construction 5 × 7.5 feet wide ☐ Continuous sheet construction 5 × 12 feet wide ☐ Other (describe)	
26D. Deck seam length (ft)	26E. Area of deck (ft^2)
For column supported tanks: 26F. Number of columns:	26G. Diameter of each column:

IV. SITE INFORMANTION (optional if providing TANKS Summary Sheets)

27. Provide the city and state on which the data in this section are based. Pittsburgh, PA	
28. Daily Average Ambient Temperature (°F)	50.31
29. Annual Average Maximum Temperature (°F)	92.6
30. Annual Average Minimum Temperature (°F)	7.5
31. Average Wind Speed (miles/hr)	9.08
32. Annual Average Solar Insulation Factor (BTU/(ft^2·day))	1.203
33. Atmospheric Pressure (psia)	14.109

V. LIQUID INFORMATION (optional if providing TANKS Summary Sheets)

34. Average daily temperature range of bulk liquid:	
34A. Minimum (°F) 17.5	34B. Maximum (°F) 102.6
35. Average operating pressure range of tank:	
35A. Minimum (psig) 0	35B. Maximum (psig) 6
36A. Minimum Liquid Surface Temperature (°F) 17.5	36B. Corresponding Vapor Pressure (psia) 0.58
37A. Average Liquid Surface Temperature (°F) 51.94	37B. Corresponding Vapor Pressure (psia) 1.113
38A. Maximum Liquid Surface Temperature (°F) 102.6	38B. Corresponding Vapor Pressure (psia) 4.95

39. Provide the following for each liquid or gas to be stored in tank. Add additional pages if necessary.			
39A. Material Name or Composition	Methanol		
39B. CAS Number	67-56-1		
39C. Liquid Density (lb/gal)	6.63		
39D. Liquid Molecular Weight (lb/lb-mole)	32.04		
39E. Vapor Molecular Weight (lb/lb-mole)	32.04		

Maximum Vapor Pressure 39F. True (psia) 39G. Reid (psia)	5		
Months Storage per Year 39H. From 39I. To	January December		

VI. EMISSIONS AND CONTROL DEVICE DATA (required)

40. Emission Control Devices (check as many as apply): ☐ Does Not Apply

- ☐ Carbon Adsorption[1]
- ☐ Condenser[1]
- ☐ Conservation Vent (psig)
  - Vacuum Setting   Pressure Setting
- ☐ Emergency Relief Valve (psig)
- ☒ Inert Gas Blanket of Nitrogen
- ☐ Insulation of Tank with
- ☐ Liquid Absorption (scrubber)[1]
- ☐ Refrigeration of Tank
- ☐ Rupture Disc (psig)
- ☐ Vent to Incinerator[1]
- ☒ Other[1] (describe): Vapor Balance, if excess gas is present ti is routed to SMR with resulting no net emissions.

[1] Complete appropriate Air Pollution Control Device Sheet.

41. Expected Emission Rate (submit Test Data or Calculations here or elsewhere in the application).

Material Name & CAS No.	Breathing Loss (lb/hr)	Working Loss		Annual Loss (lb/yr)	Estimation Method[1]
		Amount	Units		
67-56-1	0	0	0	0	Engineering Estimate

[1] EPA = EPA Emission Factor, MB = Material Balance, SS = Similar Source, ST = Similar Source Test, Throughput Data, O = Other (specify)

☐ Remember to attach emissions calculations, including TANKS Summary Sheets if applicable.

API STANDARD 620
STORAGE TANK
DATA SHEET

	June 11, 2020
BY	JDH
FILE NO.	
PAGE	1 OF 4

APPURTENANCES (TO BE COMPLETED BY MANUFACTURER AND/OR PURCHASER

1. PURCHASER/AGENT: Modular Plant Solutions
   ADDRESS:
   CITY: Alvin   PROV/STATE: TX   PC/ZIP: PHONE:
2. USER:
3. ERECTION SITE: NAME OF PLANT: Modular Methanol Plant
   LOCATION: TBD
4. TANK NO. **TK-1001*/1002/1003**   NOMINAL CAPACITY 375,000 gal   NET WORKING CAPACITY 320,000 gal
5. PUMPING RATES: IN 450 gpm   OUT 450 gpm
6. MAXIMUM OPERATING TEMPERATURE 110 °F
7. PRODUCT STORED: Methanol   DESIGN SPECIFIC GRAVITY 0.81 AT32 °F
   DESIGN METAL TEMPERATURE -40 / 250 °F   VAPOR PRESSURE 0.3 - 6 psia
8. CORROSION ALLOWANCE: SHELL 0.0625 in.   ROOF in.
   BOTTOM 0.0625 in.   STRUCTURALS in.
9. SHELL DESIGN:
   DESIGN PRESSURE 6 psig
10. ROOF DESIGN:
    ☐ SELF-SUPPORTED CONE ROOF   ☐ SELF-SUPPORTED UMBRELLA ROOF
    ☐ SUPPORTED CONE ROOF   ☑ SELF-SUPPORTED DOME ROOF
    FRANGIBLE ROOF JOINT? ☐ YES ☑ NO
11. ROOF DESIGN INFORMATION:
    UNIFORM LIVE LOAD psi
    SPECIAL LOADS (PROVIDE) SKETCH) psi
    INSULATION LOAD psi
    MAXIMUM DESIGN ROOF TEMPERATURE 250 °F
    GASES IN THE VAPOR SPACE
12. EARTHQUAKE DESIGN? ☐ YES ☑ NO   ROOF TIE RODS (3,10,4,5)? ☐ YES ☐ NO
    SEISMIC ZONE   IMPORTANCE FACTOR
    ZONE FACTOR   SITE COEFFICIENT (TABLE E-3)
13. WIND LOAD: VELOCITY 120 mph
    PROVIDE INTERMEDIATE WIND GIRDER (3.9.7)? ☐ YES ☐ NO
14. ENVIRONMENTAL EFFECTS: MAXIMUM RAINFALL in/hr
    TOTAL SNOW ACCUMULATION in.
15. SIZE RESTRICTIONS: MAXIMUM DIAMETER 40 ft   MAXIMUM HEIGHT 40 ft
16. FOUNDATION TYPE: ☐ EARTH ☐ CONCRETE RINGWALL ☑ OTHER 1/2" asphalt board on concrete pad

REMARKS

1. DOUBLE BOTTOM TANK
2. DESIGN FOR DENSITY 1.0 TO ALLOW FIELD HYDROTEST
3. Tank bottom to be sloped from the far side of the tank to the outlet nozzle "B1".
4. Tank TK-1001 will have 2 additional nozzles (detailed on nozzle sch); otherwise tanks are identical.

OF

CONSTRUCTION DETAILS (TO BE COMPLETED BY MANUFACTURER AND/OR PURCHASER

1. MANUFACTURER ______
ADDRESS ______
CITY ______ PROV/STATE ______ PC/ZIP ______ PHONE ______
SERIAL NO. ______
2. FABRICATOR ______
ADDRESS ______
CITY ______ PROV/STATE ______ PC/ZIP ______ PHONE ______
SERIAL NO. ______
3. MATERIAL SPECIFICATIONS SHELL 304 / 304L SS
ROOF 304 / 304L SS
BOTTOM 304 / 304L SS
STRUCTURALS 304 / 304L SS
4. NO. OF SHELL COURSES ______
5. PLATE WIDTHS AND THICKNESSES (INCLUDING CORROSION ALLOWANCE), IN inches
1. ______ 4. ______ 7. ______
2. ______ 5. ______ 8. ______
3. ______ 6. ______ 9. ______
6. TANK BOTTOM: PLATE THICKNESS ______ in. ☑ LAP ☐ BUTT SEA
DOUBLE BOTTOM SLOPE 0.25 in/ft ☐ TO ☐ FROM CENT
7. MINIMUM WIDTH AND THICKNESS OF BOTTOM ANNULAR PLATES (3.5) IN mm (in.): ______
8. ROOF-TO-SHELL DETAIL (FIGURE F-1) ______
9. INTERMEDIATE WIND GIRDER? ☐ YES ☐ NO TOP WIND GIRDER FOR USE AS WALKWAY? ☑ YES ☐ NO
10. ROOF TYPE: ☐ SUPPORTED ☐ SELF-SUPPORTED ☐ FLOATING
SLOPE OR RADIUS ______ mm (in.)
11. ROOF PLATE: THICKNESS ______ mm (in.) ☑ LAP ☐ BUTT ☐ JOINT
12. PAINT:
SHELL-- EXTERIOR? ☐ YES ☑ NO INTERIOR? ☐ YES ☐ NO
SURFACE PREPARATION ______
BOTTOM-- UNDERSIDE? ☐ YES ☑ NO INTERIOR? ☐ YES ☑ NO
SURFACE PREPARATION ______
STRUCTURAL STEEL-- EXTERIOR? ☐ YES ☐ NO INTERIOR? ☐ YES ☐ NO
SPECIFICATION ______
13. TANK BOTTOM COATING: INTERIOR? ☐ YES ☑ NO MATERIAL ______
APPLICATION SPECIFICATION ______
14. INSPECTION BY: SHOP ______ FIELD ______
15. WELD EXAMINATION: RADIOGRAPH YES
SUPPLEMENTARY LIQUID PENETRANT OR ULTRASONIC ______
16. FILMS ______ PROPERTY OF ______
17. LEAK TESTING: BOTTOM YES ROOF ______
SHELL ______
18. MILL TEST REPORTS: REQUIRED? ☑ YES ☐ NO
PLATE ______ STRUCTURAL SHAPES ______
19. PURCHASER'S REFERENCE DRAWING ______
20. TANK SIZE: DIAMETER 40 ft HEIGHT 40 ft
21. DATE OF STANDARD 620 EDITION ______
REMARKS ______

PAGE OF

APPURTENANCES (TO BE COMPLETED BY MANUFACTURER AND/OR PURCHASER

1. STAIRWAY STYLE: ☑ CIRCULAR ☐ STRAIGHT ANGLE TO HORIZONTAL ______ DEGREES
   LADDER ______
2. WALKWAY: WIDTH 36 in. LENGTH ______ m (ft)
3. DRAWOFF SUMP: STANDARD No sump; sloped bottom SPECIAL ______
4. BOLTED DOOR SHEET? ☐ YES ☑ NO ☐ RAISED ☐ FLUSH
5. SCAFFOLD HITCH ______
6. INTERNAL PIPING: SWING LINE ______ SUCTION LINE ______
   HEATING COIL SURFACE AREA ______ ft^2
7. ROOF DRAIN: HOSE ______ JOINTED ______
   SIPHON ______
8. NO. AND SIZE OF SHELL MANHOLES 2 @ 24"
9. NO. AND SIZE OF ROOF MANHOLES 1 @ 24"
10. SHELL NOZZLES

MARK	SIZE	FLANGED			THREADED					ORIENTATION	HEIGHT FROM	SERVICE
		SGL	DBL	SPL	A	B	C	D	E	N=0	BOTTOM	
A-1	2"	150 RFWN										Product Inlet
B-1	6"	150 RFWN										Product Outlet
B-2	4"	150 RFWN										Recirculation
D-1	4"	150 RFWN										Drain
T-1	1-1/2"	150 RFWN										Thermowell
M-1	24"	150# RF LJ										Manway
M-2	24"	150# RF LJ										Manway
A3*	3"	150 RFWN										Raw product
A-4*	1-1/2"	150 RFWN										KO liquid

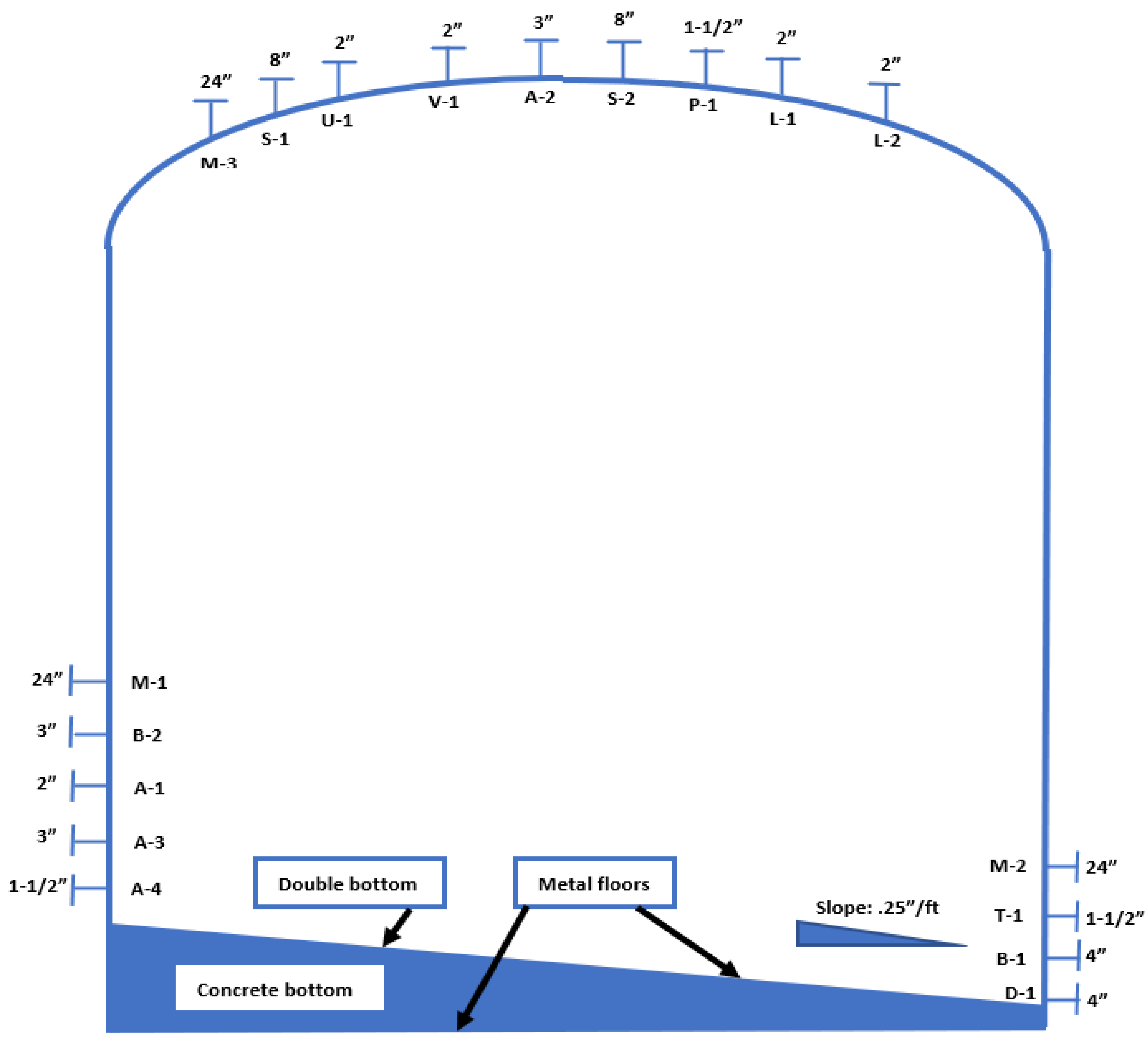
Note: *Nozzles A-3, and A-4 are only in the TK-1001 scope.

11. ROOF NOZZLES, INCLUDING VENTING CONNECTION (SEE FIGURES 3-14 AND 3-15 AND TABLES 3-16 AND 3-17

MARK	SIZE	FLANGED		THREADED	REINFORCEMENT	ORIENTATION N=0	DISTANCE FROM CENTER	SERVICE
V-1	2"	150#	RFWN					Vent
U-1	2"	150#	RFWN					Nitrogen
L-1	2"	150#	RFWN					Level
L-2	2"	150#	RFWN					Level
S-1	8"	150#	RFWN					PVMH
S-2	8"	150#	RFWN					PVRV
P-1	1-1/2"	150#	RFWN					Pressure
A-2	3"	150#	RFWN					Equalization
M-3	24"	150#	RF LJ					Manway

NOTE: SKETCHES AND/OR SEPARATE SHEETS MAY BE ATTACHED TO COVER SPECIAL REQUIREMENTS.

304/304L SS Methanol storage tanks (TK-1001, 1002/1003)



Nozzles A-3 and A-4 are only required on TK-1001. All other nozzles are on all 3 Tanks.

Attachment L
EMISSIONS UNIT DATA SHEET
BULK LIQUID TRANSFER OPERATIONS

Furnish the following information for each new or modified bulk liquid transfer area or loading rack, as shown on the *Equipment List Form* and other parts of this application. This form is to be used for bulk liquid transfer operations such as to and from drums, marine vessels, rail tank cars, and tank trucks.

Identification Number (as assigned on *Equipment List Form*): S7LB1, S7LB2

1. Loading Area Name: S7, area for Barge Loading

2. Type of cargo vessels accommodated at this rack or transfer point (check as many as apply):
☐ Drums ☒ Marine Vessels ☐ Rail Tank Cars ☐ Tank Trucks

3. Loading Rack or Transfer Point Data: Info is on a Total Plant Basis

Number of pumps	2
Number of liquids loaded	1
Maximum number of marine vessels, tank trucks, tank cars, and/or drums loading at one time	1 barge (with one spare).

4. Does ballasting of marine vessels occur at this loading area?
☐ Yes ☒ No ☐ Does not apply

5. Describe cleaning location, compounds and procedure for cargo vessels using this transfer point: Vessels are cleaned at a remote service location and/or are dedicated service.

6. Are cargo vessels pressure tested for leaks at this or any other location?
☒ Yes ☐ No
If YES, describe: Pressure tests as required will be conducted

7. Projected Maximum Operating Schedule (for rack or transfer point as a whole):

Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.
hours/day	24	24	24	24
days/week	7	7	7	7
weeks/quarter	13	13	13	13

8. Bulk Liquid Data *(add pages as necessary):*		
Pump ID No.		S7LB1. S7LB2
Liquid Name		Methanol
Max. daily throughput (1000 gal/day)		840
Max. annual throughput (1000 gal/yr)		120,000 per plant
Loading Method [1]		SUB
Max. Fill Rate (gal/min)		1500 to the barge
Average Fill Time (min/loading)		280 minutes for 420,000-gallon barge
Max. Bulk Liquid Temperature (°F)		102.6
True Vapor Pressure [2]		4.95
Cargo Vessel Condition [3]		U
Control Equipment or Method [4]		VB-O
Minimum control efficiency (%)		100*
Maximum Emission Rate	Loading (lb/hr)	NA*
	Annual (lb/yr)	NA*
Estimation Method [5]		EPA

[1] BF = Bottom Fill SP = Splash Fill SUB = Submerged Fill

[2] At maximum bulk liquid temperature

[3] B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)

[4] List as many as apply (complete and submit appropriate *Air Pollution Control Device Sheets*):CA = Carbon Adsorption LOA = Lean Oil Adsorption CO = Condensation SC = Scrubber (Absorption) CRA = Compressor- Refrigeration-Absorption TO = Thermal Oxidation or Incineration CRC = Compression-Refrigeration-Condensation

VB = Dedicated Vapor Balance (closed system)

O = other (describe) *Excess vapors, if present. are routed to SMR burners and offset natural gas emissions, therefore present no net emissions

[5] EPA = EPA Emission Factor as stated in AP-42
MB = Material Balance

TM = Test Measurement based upon test data submittal
O = other (describe)

9. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING None proposed	RECORDKEEPING Track Daily and Yearly Throughput
REPORTING None proposed	TESTING None proposed

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

Manufacturer’s operating ranges and maintenance procedures will be followed as recommended upon selection/design of the system.

Attachment L
EMISSIONS UNIT DATA SHEET
BULK LIQUID TRANSFER OPERATIONS

Furnish the following information for each new or modified bulk liquid transfer area or loading rack, as shown on the *Equipment List Form* and other parts of this application. This form is to be used for bulk liquid transfer operations such as to and from drums, marine vessels, rail tank cars, and tank trucks.

Identification Number (as assigned on *Equipment List Form*): S7LR1, S7LR2

1. Loading Area Name: S7 for Rail Tank Cars

2. Type of cargo vessels accommodated at this rack or transfer point (check as many as apply):
☐ Drums ☐ Marine Vessels ☒ Rail Tank Cars ☐ Tank Trucks

3. Loading Rack or Transfer Point Data: Info is on a Per Plant Basis

Number of pumps	2
Number of liquids loaded	1
Maximum number of marine vessels, tank trucks, tank cars, and/or drums loading at one time	2

4. Does ballasting of marine vessels occur at this loading area?
☐ Yes ☐ No ☒ Does not apply

5. Describe cleaning location, compounds and procedure for cargo vessels using this transfer point: Tanks are cleaned at a remote service location and/or are dedicated service.

6. Are cargo vessels pressure tested for leaks at this or any other location?
☒ Yes ☐ No
If YES, describe: Pressure tests as required will be conducted

7. Projected Maximum Operating Schedule (for rack or transfer point as a whole):

Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.
hours/day	24	24	24	24
days/week	7	7	7	7
weeks/quarter	13	13	13	13

8. Bulk Liquid Data *(add pages as necessary):*		
Pump ID No.		S7LR1. S7LR2
Liquid Name		Methanol
Max. daily throughput (1000 gal/day)		470
Max. annual throughput (1000 gal/yr)		120,000 per plant
Loading Method [1]		SUB or BF
Max. Fill Rate (gal/min)		400 per car
Average Fill Time (min/loading)		108.75 minutes to fill 30,500 gallon tank car
Max. Bulk Liquid Temperature (^oF)		102.6
True Vapor Pressure [2]		4.95
Cargo Vessel Condition [3]		U
Control Equipment or Method [4]		VB-O
Minimum control efficiency (%)		100*
Maximum Emission Rate	Loading (lb/hr)	NA*
	Annual (lb/yr)	NA*
Estimation Method [5]		EPA

[1] BF = Bottom Fill   SP = Splash Fill   SUB = Submerged Fill

[2] At maximum bulk liquid temperature

[3] B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)

[4] List as many as apply (complete and submit appropriate *Air Pollution Control Device Sheets*):CA = Carbon Adsorption LOA = Lean Oil Adsorption CO = Condensation SC = Scrubber (Absorption) CRA = Compressor- Refrigeration-Absorption TO = Thermal Oxidation or Incineration CRC = Compression-Refrigeration-Condensation

VB = Dedicated Vapor Balance (closed system)

O = other (describe) *Excess vapors, if present. are routed to SMR burners and offset natural gas emissions, therefore present no net emissions

[5] EPA = EPA Emission Factor as stated in AP-42
MB = Material Balance

TM = Test Measurement based upon test data submittal O = other (describe)

9. **Proposed Monitoring, Recordkeeping, Reporting, and Testing** Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.	
MONITORING None proposed	RECORDKEEPING Track Daily and Yearly Throughput
REPORTING None proposed	TESTING None proposed
MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.	
RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.	
REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.	
TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.	

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty Manufacturer’s operating ranges and maintenance procedures will be followed as recommended upon selection/design of the system.

Attachment L
EMISSIONS UNIT DATA SHEET
BULK LIQUID TRANSFER OPERATIONS

Furnish the following information for each new or modified bulk liquid transfer area or loading rack, as shown on the *Equipment List Form* and other parts of this application. This form is to be used for bulk liquid transfer operations such as to and from drums, marine vessels, rail tank cars, and tank trucks.

Identification Number (as assigned on *Equipment List Form*): S7LT1, S7LT2

1. Loading Area Name: S7, area for Truck Tanks

2. Type of cargo vessels accommodated at this rack or transfer point (check as many as apply):
☐ Drums ☐ Marine Vessels ☐ Rail Tank Cars ☒ Tank Trucks

3. Loading Rack or Transfer Point Data: **Information below is on a Per Plant Basis**

Number of pumps	2
Number of liquids loaded	1
Maximum number of marine vessels, tank trucks, tank cars, and/or drums loading at one time	2

4. Does ballasting of marine vessels occur at this loading area?
☐ Yes ☐ No ☒ Does not apply

5. Describe cleaning location, compounds and procedure for cargo vessels using this transfer point: Tanks are cleaned at a remote service location and/or are dedicated service.

6. Are cargo vessels pressure tested for leaks at this or any other location?
☒ Yes ☐ No
If YES, describe: Tank trucks are pressure tested with nitrogen.

7. Projected Maximum Operating Schedule (for rack or transfer point as a whole):

Maximum	Jan. - Mar.	Apr. - June	July - Sept.	Oct. - Dec.
hours/day	24	24	24	24
days/week	7	7	7	7
weeks/quarter	13	13	13	13

8. Bulk Liquid Data *(add pages as necessary):*		
Pump ID No.		S7LT1, S7LT2
Liquid Name		Methanol
Max. daily throughput (1000 gal/day)		432 per unit (A, B, C)
Max. annual throughput (1000 gal/yr)		120,000 per plant
Loading Method [1]		BF
Max. Fill Rate (gal/min)		400 single tank truck, 800 two tank trucks
Average Fill Time (min/loading)		15 minutes loading, total truck time 35 to 40 minutes
Max. Bulk Liquid Temperature (°F)		102.6
True Vapor Pressure [2]		4.95
Cargo Vessel Condition [3]		U
Control Equipment or Method [4]		VB-O
Minimum control efficiency (%)		100*
Maximum Emission Rate	Loading (lb/hr)	NA*
	Annual (lb/yr)	NA*
Estimation Method [5]		EPA

[1] BF = Bottom Fill SP = Splash Fill SUB = Submerged Fill

[2] At maximum bulk liquid temperature

[3] B = Ballasted Vessel, C = Cleaned, U = Uncleaned (dedicated service), O = other (describe)

[4] List as many as apply (complete and submit appropriate *Air Pollution Control Device Sheets*):CA = Carbon Adsorption LOA = Lean Oil Adsorption CO = Condensation SC = Scrubber (Absorption) CRA = Compressor- Refrigeration-Absorption TO = Thermal Oxidation or Incineration CRC = Compression-Refrigeration-Condensation

VB = Dedicated Vapor Balance (closed system)

O = other (describe) *Excess vapors, if present. are routed to SMR burners and offset natural gas emissions, therefore present no net emissions

[5] EPA = EPA Emission Factor as stated in AP-42
MB = Material Balance

TM = Test Measurement based upon test data submittal
O = other (describe)

9. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING	RECORDKEEPING
None proposed	Track Daily and Yearly Throughput
REPORTING	TESTING
None proposed	None proposed

MONITORING. PLEASE LIST AND DESCRIBE THE PROCESS PARAMETERS AND RANGES THAT ARE PROPOSED TO BE MONITORED IN ORDER TO DEMONSTRATE COMPLIANCE WITH THE OPERATION OF THIS PROCESS EQUIPMENT OPERATION/AIR POLLUTION CONTROL DEVICE.

RECORDKEEPING. PLEASE DESCRIBE THE PROPOSED RECORDKEEPING THAT WILL ACCOMPANY THE MONITORING.

REPORTING. PLEASE DESCRIBE THE PROPOSED FREQUENCY OF REPORTING OF THE RECORDKEEPING.

TESTING. PLEASE DESCRIBE ANY PROPOSED EMISSIONS TESTING FOR THIS PROCESS EQUIPMENT/AIR POLLUTION CONTROL DEVICE.

10. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty

Manufacturer’s operating ranges and maintenance procedures will be followed as recommended upon selection/design of the system.

ATTACHMENT N INTERNAL COMBUSTION ENGINE DATA SHEET

Complete this data sheet for each internal combustion engine at the facility. Include manufacturer performance data sheet(s) or any other supporting document if applicable. Use extra pages if necessary. *Generator(s) and microturbine generator(s) shall also use this form.*

Emission Unit ID# 1		S8G1, S8G2, …, S8G7					
Engine Manufacturer/Model		Caterpillar/CG260-16					
Manufacturers Rated bhp/rpm		5500/900					
Source Status2		NS					
Date Installed/ Modified/Removed/Relocated 3		2022					
Engine Manufactured /Reconstruction Date4		2021					
Check all applicable Federal Rules for the engine (include EPA Certificate of Conformity if applicable)5		☐X 40CFR60 Subpart JJJJ ☐ JJJJ Certified? ☐ 40CFR60 Subpart IIII ☐ IIII Certified? ☐X 40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources		☐ 40CFR60 Subpart JJJJ ☐ JJJJ Certified? ☐ 40CFR60 Subpart IIII ☐ IIII Certified? ☐ 40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources		☐ 40CFR60 Subpart JJJJ ☐ JJJJ Certified? ☐ 40CFR60 Subpart IIII ☐ IIII Certified? ☐ 40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	
Engine Type6		4SLB					
APCD Type7		SCR and OXCAT					
Fuel Type8		Natural Gas					
H_2S (gr/100 scf)		0.25					
Operating bhp/rpm		5500/900					
BSFC (BTU/bhp-hr)		5815					
Hourly Fuel Throughput		32,515 sft ^{3}/hr gal/hr		ft^3/hr gal/hr		ft ^{3}/hr gal/hr	
Annual Fuel Throughput (Must use 8,760 hrs/yr unless emergency generator)		2852 MMft^3/yr gal/yr		MMft^3/yr gal/yr		MMft^3/yr gal/yr	
Fuel Usage or Hours of Operation Metered		Yes X ☐ No ☐		Yes ☐ No ☐		Yes ☐ No ☐	
Calculation Methodology 9	**Pollutant10**	**Hourly PTE (lb/hr)11**	**Annual PTE (tons/year) 11**	**Hourly PTE (lb/hr) 11**	**Annual PTE (tons/year) 11**	**Hourly PTE (lb/hr) 11**	**Annual PTE (tons/year) 11**
MD	NO_x	1.595	6.98				
MD	CO	1.258	5.51				
MD	VOC	0.958	4.20				
AP-42	SO_2	0.02	0.087				
MD	PM_{10}	0.114	0.50				
MD	Formaldehyde	0.267	1.164				
MD/AP-42	Total HAPs	0.513	2.246				
	GHG (CO_2 e)						

1 Enter the appropriate Source Identification Number for each natural gas-fueled reciprocating internal combustion engine/generator engine located at the well site. Multiple engines should be designated CE-1, CE-2, CE-3 etc. Generator engines should be designated GE-1, GE-2, GE-3 etc. Microturbine generator engines should be designated MT-1, MT-2, MT-3 etc. If more than three (3) engines exist, please use additional sheets.

2 Enter the Source Status using the following codes:

NS	Construction of New Source (installation)	ES	Existing Source
MS	Modification of Existing Source	RS	Relocated Source
REM	Removal of Source		

3 Enter the date (or anticipated date) of the engine's installation (construction of source), modification, relocation or removal.

4 Enter the date that the engine was manufactured, modified or reconstructed.

5 Is the engine a certified stationary spark ignition internal combustion engine according to 40CFR60 Subpart IIII/JJJJ? If so, the engine and control device must be operated and maintained in accordance with the manufacturer's emission-related written instructions. You must keep records of conducted maintenance to demonstrate compliance, but no performance testing is required. If the certified engine is not operated and maintained in accordance with the manufacturer's emission-related written instructions, the engine will be considered a non-certified engine and you must demonstrate compliance as appropriate.

Provide a manufacturer's data sheet for all engines being registered.

6 Enter the Engine Type designation(s) using the following codes:

2SLB	Two Stroke Lean Burn	4SRB	Four Stroke Rich Burn
4SLB	Four Stroke Lean Burn		

7 Enter the Air Pollution Control Device (APCD) type designation(s) using the following codes:

A/F	Air/Fuel Ratio	IR	Ignition Retard
HEIS	High Energy Ignition System	SIPC	Screw-in Precombustion Chambers
PSC	Prestratified Charge	LEC	Low Emission Combustion
NSCR	Rich Burn & Non-Selective Catalytic Reduction	OxCat	Oxidation Catalyst
SCR	Lean Burn & Selective Catalytic Reduction		

8 Enter the Fuel Type using the following codes:

PQ	Pipeline Quality Natural Gas	RG	Raw Natural Gas /Production Gas	D	Diesel

9 Enter the Potential Emissions Data Reference designation using the following codes. Attach all reference data used.

MD	Manufacturer's Data	AP	AP-42	
GR	GRI-HAPCalc™	OT	Other	(please list)

10 Enter each engine's Potential to Emit (PTE) for the listed regulated pollutants in pounds per hour and tons per year. PTE shall be calculated at manufacturer's rated brake horsepower and may reflect reduction efficiencies of listed Air Pollution Control Devices. Emergency generator engines may use 500 hours of operation when calculating PTE. PTE data from this data sheet shall be incorporated in the *Emissions Summary Sheet*.

11 PTE for engines shall be calculated from manufacturer's data unless unavailable.

Project Name: WV Methane

Engine: CG260-16, 900rpm, 25C Air Inlet, 190m
Fuel gas: Standard 80MN fuel

Reference O2 at mg/m3 [%] (Europe)	5			
Reference O2 at ppm [%] (USA)	15			
				INPUT
Dry exhaust gas volume [mn³/h]				14894
Engine mechanical power [kW]				4102
Genset electrical power [ekW]				4000
Exhaust volume flow dry O2 [%]				9.90
Emission [mg/mn3] at	5	%O2	NOx	500.00
Emission [mg/mn3] at	5	%O2	CO	682.00
Emission [mg/mn3] at	5	%O2	THC	843.00
Emission [mg/mn3] at	5	%O2	NMHC (VOC)	126.45
Emission [mg/mn3] at	5	%O2	HCHO	144.00
Emission [mg/mn3] at	5	%O2	PM 2.5	5.00
Emission [mg/mn3] at	5	%O2	PM 10	5.00
				OUTPUT
Emission [ppm] at	15	%O2	NOx	91.46
Emission [ppm] at	15	%O2	CO	204.60
Emission [ppm] at	15	%O2	THC	252.90
Emission [ppm] at	15	%O2	NMHC (VOC)	66.23
Emission [ppm] at	15	%O2	HCHO	45.00
Emission [ppm] at	15	%O2	Particles	
Emission [ppm] at	15	%O2	SO2	0.00
Emission [g/bhp-hr]			NOx	0.939
Emission [g/bhp-hr]			CO	1.281
Emission [g/bhp-hr]			THC	1.583
Emission [g/bhp-hr]			NMHC (VOC)	0.238
Emission [g/bhp-hr]			HCHO	0.270
Emission [g/bhp-hr]			PM 2.5	0.009
Emission [g/bhp-hr]			PM 10	0.009
Emission [g/bhp-hr]			SO2	0.000
Emission [g/bhp-hr]			CO2	336
Emission [lb/hr]			NOx	11.390
Emission [lb/hr]			CO	15.536
Emission [lb/hr]			THC	19.203
Emission [lb/hr]			NMHC (VOC)	2.880
Emission [lb/hr]			HCHO	3.280
Emission [lb/hr]			PM 2.5	0.114
Emission [lb/hr]			PM 10	0.114
Emission [lb/hr]			SO2	0.000
Emission [lb/hr]			CO2	4074
Emission [lb/MWh]			NOx	2.847
Emission [lb/MWh]			CO	3.884
Emission [lb/MWh]			THC	4.801
Emission [lb/MWh]			NMHC (VOC)	0.720
Emission [lb/MWh]			HCHO	0.820
Emission [lb/MWh]			PM 2.5	0.028
Emission [lb/MWh]			PM 10	0.028
Emission [lb/MWh]			SO2	0.000
Emission [lb/MWh]			CO2	1019
Emission [kg/MWh]			NOx	1.292
Emission [kg/MWh]			CO	1.762
Emission [kg/MWh]			THC	2.178
Emission [kg/MWh]			NMHC (VOC)	0.327
Emission [kg/MWh]			HCHO	0.372
Emission [kg/MWh]			PM 2.5	0.013
Emission [kg/MWh]			PM 10	0.013
Emission [kg/MWh]			SO2	0.000
Emission [kg/MWh]			CO2	462

ATTACHMENT M: AIR POLLUTION CONTROL DEVICES

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): C1A, C1B, C1C

Equipment Information

1. Manufacturer: Model No.	2. Control Device Name: Type: Selective Catalytic Reduction/oxidation cat
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction.	
6. Submit a schematic and diagram with dimensions and flow rates.	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: 69,103 SCFM	10. Capacity:76,013 SCFM
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. Ammonia injection with rates TBD	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal.	

Gas Stream Characteristics

14. Are halogenated organics present? ☐ Yes ☒ No
Are particulates present? ☐ Yes ☒ No
Are metals present? ☐ Yes ☒ No

15. Inlet Emission stream parameters:	Maximum	Typical
Pressure (mmHg):		
Heat Content (BTU/scf):		NA
Oxygen Content (%):		9.36
Moisture Content (%):		19.04
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ Particulate (type):	☐ SO_x	☐ Odor ☒ Other NOx, CO	
17. Inlet gas velocity: ft/sec		18. Pollutant specific gravity:	
19. Gas flow into the collector: ACF @ °F and 14.78 PSIA		20. Gas stream temperature: Inlet: 725 °F; Outlet: 721 °F	
21. Gas flow rate: Design Maximum: ~143,232 ACFM; Average Expected: 130,211 ACFM		22. Particulate Grain Loading in grains/scf: Inlet: N/A; Outlet: N/A	

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant lb/hr	IN Pollutant grains/acf	Emission Capture Efficiency %	OUT Pollutant lb/hr	OUT Pollutant grains/acf	Control Efficiency %
A NOx	29.9		100	2.99		90.0
B CO	3.31		100	1.83		44.8
C VOC	1.00		100	1.00		0.0
D NH3	0.69		N/A	0.69		N/A
E						

24. Dimensions of stack: >175 Height ft. Diameter ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:

Particulate Size Range (microns)	Particle Size Distribution at Inlet to Collector — Weight % for Size Range	Fraction Efficiency of Collector — Weight % for Size Range
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

28. Describe the collection material disposal system:

29. Have you included ***Other Collectores Control Device*** in the Emissions Points Data Summary Sheet?

30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING: The SMR stacks will have a CEMS that measuring CO and NOx. A Predictive Emission Monitoring Systems (PEMS) will be used to track and record SMR flue gas emissions based on event simulation data (shown in Attachment N) and measured process parameters as input variables, and duration of event.	RECORDKEEPING: Maintain logs of NOx and CO. Track and record SSM events using the PEM to record SMR emissions.
REPORTING: None proposed.	TESTING: Stack testing of CO and NOx to be completed within 180 days after startup. CEMS calibration to be completed within 180 days after startup. Results will be provided to the WV Division of Air Quality. Perform periodic QA testing on CEMS.

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer’s Guaranteed Control Efficiency for each air pollutant.
Manufacturer is projecting on a vol ppm, 3% O2 dry max – Nox 5 ppm, CO 5 ppm, NH3 3 ppm
Values used for permit are Nox 8 ppm, CO 8 ppm, NH3 5 ppm

32. Manufacturer’s Guaranteed Control Efficiency for each air pollutant.

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Attachment M
Air Pollution Control Device Sheet
(FLARE SYSTEM)

Control Device ID No. (must match Emission Units Table): C2A, C2B, C2C

Equipment Information

1. Manufacturer: Manufactuer not selected Model No.	2. Method: ☒ Elevated flare ☐ Ground flare ☐ Other Describe Dual HP/LP Flare

3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.

4. Method of system used:
☐ Steam-assisted ☐ Air-assisted ☐ Pressure-assisted ☒ Non-assisted

5. Maximum capacity of flare: scf/min scf/hr	6. Dimensions of stack: Diameter ft. Height >175 ft.
7. Estimated combustion efficiency: (Waste gas destruction efficiency) Estimated: 99 % Minimum guaranteed: 98 %	8. Fuel used in burners: ☒ Natural Gas ☐ Fuel Oil, Number ☒ Other, Specify:
9. Number of burners: Rating: BTU/hr 10. Will preheat be used? ☐ Yes ☒ No	11. Describe method of controlling flame:
12. Flare height: >175 ft 13. Flare tip inside diameter: ft	14. Natural gas flow rate to flare pilot flame per pilot light: 2491 scf/min 41.5 scf/hr
15. Number of pilot lights: Total 6 @ 45,000 BTU/hr	16. Will automatic re-ignition be used? ☒ Yes ☐ No

17. If automatic re-ignition will be used, describe the method:

18. Is pilot flame equipped with a monitor? ☐ Yes ☐ No
If yes, what type? ☒ Thermocouple ☐ Infra-Red
☐ Ultra Violet ☐ Camera with monitoring control room
☐ Other, Describe:

19. Hours of unit operation per year: 8,760

Steam Injection

20. Will steam injection be used? ☐ Yes ☒ No	21. Steam pressure PSIG Minimum Expected: Design Maximum:
22. Total Steam flow rate: LB/hr	23. Temperature: °F
24. Velocity ft/sec	25. Number of jet streams
26. Diameter of steam jets: in	27. Design basis for steam injected: LB steam/LB hydrocarbon
28. How will steam flow be controlled if steam injection is used?	

Characteristics of the Waste Gas Stream to be Burned

29.

Name	Quantity Grains of $H_2S/100\ ft^3$	Quantity (LB/hr, ft^3/hr, etc)	Source of Material
LP Gas		Attachment N	PNG; Leaks
Cold Startup Gas		Attachment N	
Syn Loop Trip		Attachment N	
Reformer Trip		Attachment N	
Shutdown		Attachment N	

30. Estimate total combustible to flare: See Attachment N LB/hr or ACF/hr
(Maximum mass flow rate of waste gas) scfm

31. Estimated total flow rate to flare including materials to be burned, carrier gases, auxiliary fuel, etc.:
See Attachment N LB/hr or ACF/hr

32. Give composition of carrier gases:
See Attachment N

33. Temperature of emission stream: °F Heating value of emission stream: BTU/ft^3 Mean molecular weight of emission stream: MW = lb/lb-mole	34. Identify and describe all auxiliary fuels to be burned. BTU/scf BTU/scf BTU/scf BTU/scf BTU/scf
35. Temperature of flare gas: °F	36. Flare gas flow rate: scf/min
37. Flare gas heat content: BTU/ft^3	38. Flare gas exit velocity: scf/min

39. Maximum rate during emergency for one major piece of equipment or process unit: scf/min

40. Maximum rate during emergency for one major piece of equipment or process unit: BTU/min

41. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

42. Describe the collection material disposal system:
There is no material disposal system for this flare.

43. Have you included ***Flare Control Device*** in the Emissions Points Data Summary Sheet?

44. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING:	RECORDKEEPING:
Monitor the emission point opacity via Method 9 and Method 22. The units will have PEMS to track and record HP Flare gas emisssions based on simulated data (Appendix N), measured process parameters as input variables, and duration of events.	As required per 40CFR60, Subpart A, Section 60.18.
REPORTING: None proposed.	TESTING: None proposed.

MONITORING:	Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING:	Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING:	Please describe any proposed emissions testing for this process equipment on air pollution control device.

45. Manufacturer's Guaranteed Capture Efficiency for each air pollutant.
Capture efficiency is based on facility design and is anticipated to be 100% for all emissions sources that are sent to the flare.

46. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
98%

47. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.
The flare is specifically design for each process and the final design has not been completed. Operating ranges and maintenance procedures will be identified in the final design and with the flare system vendor. The recommended operating and maintenance procedures will be followed.

Attachment M
Air Pollution Control Device Sheet
(OTHER COLLECTORS)

Control Device ID No. (must match Emission Units Table): C3G1, C3G2, …, C3G7

Equipment Information

1. Manufacturer: Model No. Miratech	2. Control Device Name: SCR/Oxidation System Type: SCR and OxyCat
3. Provide diagram(s) of unit describing capture system with duct arrangement and size of duct, air volume, capacity, horsepower of movers. If applicable, state hood face velocity and hood collection efficiency.	
4. On a separate sheet(s) supply all data and calculations used in selecting or designing this collection device.	
5. Provide a scale diagram of the control device showing internal construction. See Miratech Data Sheets	
6. Submit a schematic and diagram with dimensions and flow rates. See Miratech Data Sheets	
7. Guaranteed minimum collection efficiency for each pollutant collected:	
8. Attached efficiency curve and/or other efficiency information.	
9. Design inlet volume: SCFM	10. Capacity:
11. Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any. Depending on Reagent -- anhydrous or aqueous ammonia.	
12. Attach any additional data including auxiliary equipment and operation details to thoroughly evaluate the control equipment.	
13. Description of method of handling the collected material(s) for reuse of disposal.	

Gas Stream Characteristics

14. Are halogenated organics present?	☐ Yes	☒ No
Are particulates present?	☐ Yes	☒ No
Are metals present?	☐ Yes	☒ No

15. Inlet Emission stream parameters:	**Maximum**	**Typical**
Pressure (mmHg):		
Heat Content (BTU/scf):		
Oxygen Content (%):		
Moisture Content (%):		
Relative Humidity (%):		

16. Type of pollutant(s) controlled: ☐ Particulate (type):	☐ SO_x	☐ Odor ☒ Other NOx, CO, VOC, Organic HAPs

17. Inlet gas velocity: ft/sec	18. Pollutant specific gravity:
19. Gas flow into the collector: ACF @ °F and PSIA	20. Gas stream temperature: Inlet: °F Outlet: °F
21. Gas flow rate: Design Maximum: ACFM Average Expected: ACFM	22. Particulate Grain Loading in grains/scf: Inlet: Outlet:

23. Emission rate of each pollutant (specify) into and out of collector:

Pollutant	IN Pollutant		Emission Capture Efficiency %	OUT Pollutant		Control Efficiency %
	lb/hr	grains/acf		lb/hr	grains/acf	
A NOx	11.390		100	1.595		86.0
B CO	15.536		100	1.258		91.7
C VOC	1.916		100	0.958		50.0
D Formaldehyde	3.280		100	0.295		91.9
E HAPS	4.177		100	0.542		86.4

24. Dimensions of stack: Height ft. Diameter ft.

25. Supply a curve showing proposed collection efficiency versus gas volume from 25 to 130 percent of design rating of collector.

Particulate Distribution

26. Complete the table:	Particle Size Distribution at Inlet to Collector	Fraction Efficiency of Collector
Particulate Size Range (microns)	**Weight % for Size Range**	**Weight % for Size Range**
0 – 2		
2 – 4		
4 – 6		
6 – 8		
8 – 10		
10 – 12		
12 – 16		
16 – 20		
20 – 30		
30 – 40		
40 – 50		
50 – 60		
60 – 70		
70 – 80		
80 – 90		
90 – 100		
>100		

27. Describe any air pollution control device inlet and outlet gas conditioning processes (e.g., gas cooling, gas reheating, gas humidification):

28. Describe the collection material disposal system:

29. Have you included ***Other Collectores Control Device*** in the Emissions Points Data Summary Sheet?

30. **Proposed Monitoring, Recordkeeping, Reporting, and Testing**
Please propose monitoring, recordkeeping, and reporting in order to demonstrate compliance with the proposed operating parameters. Please propose testing in order to demonstrate compliance with the proposed emissions limits.

MONITORING: SCR will come with a SCR controller and analyzer	RECORDKEEPING:
REPORTING:	TESTING: Stack testing of CO and NOx to be completed within 180 days after startup. Results will be provided to the WV Division of Air Quality.

MONITORING: Please list and describe the process parameters and ranges that are proposed to be monitored in order to demonstrate compliance with the operation of this process equipment or air control device.
RECORDKEEPING: Please describe the proposed recordkeeping that will accompany the monitoring.
REPORTING: Please describe any proposed emissions testing for this process equipment on air pollution control device.
TESTING: Please describe any proposed emissions testing for this process equipment on air pollution control device.

31. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
Target Steady Test Conditions DRE for SCR NOx = 93.9%, CO = 95%, VOC = 87.3%, Formaldehyde = 93.9%

32. Manufacturer's Guaranteed Control Efficiency for each air pollutant.
Guaranteed DRE for SCR NOx = 86%, CO = 92%, VOC = 50.0%, Formaldehyde = 91.9%

33. Describe all operating ranges and maintenance procedures required by Manufacturer to maintain warranty.

Application & Performance Warranty Data

Project Information

Project Name:	9375721
Application:	Prime Power
Number Of Engines:	7
Operating Hours per Year:	8760

Engine Specifications

Engine Manufacturer:	Caterpillar
Model Number:	CG260-16
Rated Speed:	900 RPM
Type of Fuel:	Natural Gas
Type of Lube Oil:	0.6 wt% sulfated ash or less
Lube Oil Consumption:	0.1 % Fuel Consumption
Number of Exhaust Manifolds:	1

Engine Cycle Data

Load	Speed	Power	Exhaust Flow	Exhaust Temp.	Fuel Cons.	NO_x	CO	NMHC	NMNEHC	CH_2O	O_2	H_2O
%		*kW*	*lb/hr*	*F*		*g/bhp-hr*	*g/bhp-hr*	*g/bhp-hr*	*g/bhp-hr*	*g/bhp-hr*	*%*	*%*
100	Rated	4,102	48,588	853		0.939	1.281	0.238	0.158	0.27	9.9	9.9

Emission Data (100% Load)

Emission	Raw Engine Emissions						Target Outlet Emissions						Calculated Reduction
	g/bhp-hr	*tons/yr*	*ppmvd @ 15% O_2*	*ppmvd*	*g/kW-hr*	*lb/MW-hr*	*g/bhp-hr*	*tons/yr*	*ppmvd @ 15% O_2*	*ppmvd*	*g/kW-hr*	*lb/MW-hr*	
NO_X*	0.94	49.88	88	164	1.259	2.78	0.06	3.04	5	10	0.077	0.17	93.9%
CO	1.28	68.05	197	368	1.718	3.79	0.06	3.4	10	18	0.086	0.19	95%
NMNEHC**	0.16	8.39	42	79	0.212	0.47	0.02	1.06	5	10	0.027	0.06	87.3%
CH_2O	0.27	14.34	39	72	0.362	0.8	0.02	0.99	3	5	0.025	0.06	93.1%

* MW referenced as NO_2

** MW referenced as CH_4. Propane in the exhaust shall not exceed 15% by volume of the NMNEHC compounds in the exhaust, excluding aldehydes. The 15% (vol.) shall be established on a wet basis, reported on a methane molecular weight basis. The measurement of exhaust NMNEHC composition shall be based upon EPA method 320 (FTIR), and shall exclude formaldehyde.

System Specifications

SCR/Oxidation System Specifications (SP-EM120.180-TBD, ACIS II, Commissioning & Startup, SP-PT-72-TBD, 36" Mixing Section (3 Mixer))

Design Exhaust Flow Rate:	48,588 lb/hr
Design Exhaust Temperature[1]:	853°F
Housing Model Number:	SP-PT-72-TBD
Element Model Number:	SCRC-084-150-300
Number of Catalyst Layers:	2
Number of Spare Catalyst Layers:	0
Total Catalyst Volume:	115 cubic feet
SCR Catalyst Volume:	86 cubic feet
SCR Catalyst Space Velocity:	7,384 1/hr
Ammonia Reduction Catalyst Volume:	29 cubic feet
Ammonia Reduction Catalyst Space Velocity:	22,153 1/hr
System Pressure Loss:	12.0 inches of WC (Clean) (29.9 mBar)
Sound Attenuation:	25-30 dBA insertion loss
Exhaust Temperature Limits:	572 – 977°F (300 – 525°C)
Reactant:	Urea
Percent Concentration:	32.5%
System Dosing Capacity:	20 L/hr
Estimated Reactant Consumption:	3.1 gal/hr (11.9 L/hr) / Per Engine

MIRATECH Scope of Supply & Equipment Details

	Model Number	Quantity
Selective Catalytic Reduction Housing	**SP-EM120.180-TBD**	**1 / engine**
SCR Housing	SP-EM120.180-TBD	1 / engine
• Number of Catalyst Layers	4.0	
• Number of Spare Catalyst Layers	2.0	
• Number of Catalyst Blocks per Layer	120	
• Material	Carbon Steel	
• Paint	None	
• Inlet Pipe Size & Connection	36 inch FF Flange, 150# ANSI standard bolt pattern	
• Outlet Pipe Size & Connection	36 inch FF Flange, 150# ANSI standard bolt pattern	
• Door Location	Top	
• Dimensions	78.000" H x 94.500" W x 256" L	
• Weight Without Catalyst	7,942 lbs	
• Weight Fully Loaded With Catalyst	15,708 lbs	
• Insulation	None	
Tray Set	Tray Set-EM120-300mm	4 / engine
SCR Catalyst	SCRC-084-150-300	360 / engine
Redox Catalyst	ROM.1300.46.C3.C5.S150.045.255	120 / engine
Oxidation Housing & Catalyst	**SP-PT-72-TBD**	**1 / engine**
Catalyst Housing	SP-PT-72-TBD-HSG	1 / engine
• Material	Carbon Steel	
• Paint	Standard High Temperature Black Paint	
• Approximate Diameter	72 inches	
• Inlet Pipe Size & Connection	24 inch FF Flange, 150# ANSI standard bolt pattern	
• Outlet Pipe Size & Connection	36 inch FF Flange, 150# ANSI standard bolt pattern	
• Overall Length	198 inches	
• Instrumentation Ports	2 inlet/2 outlet (1/2" NPT)	
• Oxygen Sensor Ports	1 inlet/1 outlet (18mm)	
Oxidation Catalyst	MECB-OX-SB4000-2421-3600-291	4 / engine
Blind Catalyst	MEC-BK-XX-2421-4000-291	2 / engine
Nut, Bolt, and Gasket Set	NBG-S3624-6	1 / engine
Mixing Section	**36" Mixing Section (3 Mixer)**	**1 / engine**
Pre-Fabricated Mixing Section	36" Mixing Section (3 Mixer)	1 / engine
• Material	Carbon Steel w/ 304 SS Hydrolysis Section	
• Overall Length	221 inches	
• Weight	1416 lbs	
Flow Dresser	36" Flow Dresser	1 / engine
• Weight	128 lbs	

	Model Number	Quantity
Dosing Mixer	36" Dosing Mixer	1 / engine
• Weight	47 lbs	
Static Mixer	36" Static Mixer	2 / engine
• Weight	55 lbs	
Mixing Section Injector Flange	36" Mixing Section Injector Flange	1 / engine
• Weight	4 lbs	
SCR Control System	**ACIS II**	**1 / engine**
SCR Controller	SNQ20.lab.ops.no0100	1 / engine
Dosing Box	SEN20.lab	1 / engine
• Overall Dimensions	15.75 W x 15.75 H x 6.562 D	
• Weight	27 lbs	
Reactant Pump	VPN20.lab	1 / engine
• Overall Dimensions	19.685 W x 15.906 H x 23.031 D	
• Weight	62 lbs	
Reactant Filter	FILTER20	1 / engine
Injector	DEN20.800	1 / engine
• Weight	10 lbs	
Natural Gas Sample Probe	LS1075	1 / engine
• Weight	0.94 lbs	
Differential Pressure Sensor	PT.040	1 / engine
Feed Forward	FWD	1 / engine
Bypass Probe	NP800	1 / engine
Temperature Sensor	TT.12.32.1112	2 / engine
Air Compressor	CA20.lab	1 / engine
• Overall Dimensions	9.842 W x 26.772 H x 15.748 D	
• Weight	26 lbs	
Commissioning & Startup	**Commissioning & Startup**	**1 / project**
Analyzer Charges	Analyzer Charges	1 / project
Expense Charges	Expense Charges	1 / project
Labor Charges	Labor Charges	1 / project

Optional Content MIRATECH Scope of Supply & Equipment Details

	Model Number	Quantity
Maintenance Pack	**ACIS II Maintenance Pack**	**1 / project**
Maintenance Pack	VPN20 Maintenance Pack	1 / project
SCR Parts	601.0013	1 / project
Maintenance Pack	SEN20 Maintenance Pack	1 / project
SCR Parts	2020.0233	1 / project
SCR Parts	902.0021	1 / project
Maintenance Pack	CA20 Maintenance Pack	1 / project
SCR Parts	803.0004	1 / project
SCR Parts	2020.0243	1 / project
Maintenance Pack	SNQ Maintenance Pack	1 / project
SCR Parts	2040.0188	1 / engine
SCR Parts	1304.0201	1 / project
SCR Parts	601.0049	2 / project
SCR Parts	2010.0067	2 / project
SCR Parts	6000.0058	1 / project
SCR Parts	1103.0211	2 / project
Maintenance Pack	DEX20.XXX Maintenance Pack	1 / project
SCR Parts	2070.0158	2 / project
SCR Parts	301.1317	2 / project
SCR Parts	302.0017	2 / project
SCR Parts	1304.0006	2 / project
SCR Parts	302.0018	2 / project
SCR Parts	1304.0008	2 / project
Spare Parts	**ACIS II Recommended Spare Parts**	**1 / project**
Recommended Spare Parts	VPN20 Recommended Spare Parts	1 / project
SCR Parts	601.0038	1 / project
Recommended Spare Parts	SEN20 Recommended Spare Parts	1 / project
SCR Parts	2020.0233	1 / project
Recommended Spare Parts	CA20 Recommended Spare Parts	1 / project
SCR Parts	2020.0238	1 / project
Recommended Spare Parts	SNQ Recommended Spare Parts	1 / project
SCR Parts	6000.8618	1 / project
SCR Parts	2020.0279	1 / project
SCR Parts	6000.0058	1 / project
SCR Parts	601.0009	1 / project
SCR Reactant Tank	**SW550**	**1 / engine**
Reactant Tank	SW550	1 / engine

	Model Number	Quantity
• Material	Cross-Linked Polyethylene	
• Tank Dimensions	50.5 D x 82 H	
• Capacity	500 US Gallons	
• Weight	130 lbs	
• Wall Construction	Single	
• Insulation	None	
• Heat Trace	None	
• Seismic Tie Downs	None	
Reactant Tank Level Indicator	**TLI**	**1 / engine**
Reactant Tank Level Indicator	TLI	1 / engine
Level Transmitter	LU20	1 / engine
Level Controller	LI55	1 / engine
Level Controller Enclosure	LM92	1 / engine

Customer Scope Of Supply

- Support Structure
- Attachment to Support Structure (Bolts, Nuts, Levels, etc.)
- Expansion Joints
- Exhaust Piping
- Inlet Pipe Bolts, Nuts, & Gasket
- Outlet Pipe Bolts, Nuts, & Gasket
- Insulation for Exhaust Piping
- Power Input (230 VAC, 60 Hz, Single Phase)
- Component Installation Including External Tubing and Wiring
- Isolated Engine Load Signal to MIRATECH Equipment (4-20 mA)
- Dry Contact (N.O.) for Engine Run Signal to MIRATECH Equipment
- Heat Tracing of Reactant Lines (Required when Ambient Temperatures are Below 40 °F)
- Heat Tracing of Sample Lines (Required when Ambient Temperatures are Below 32 °F)
- Design for Structural Support and Thermal Expansion

Special Notes & Conditions

1. For housings and exhaust components that are insulated, internally or externally, please refer to Section 7.1 of the General Terms and Conditions of Sale to prevent voiding MIRATECH product warranty.

    - Carbon steel is suitable for temperatures up to 900° F / 482° C continuously, when covered with external insulation or a heat shield. For continuous operation above 900° F / 482° C, where the equipment is externally insulated or has a heat shield, stainless steel should be used.

- A packed silencer installed upstream of the MIRATECH catalyst system will void MIRATECH's limited warranty.

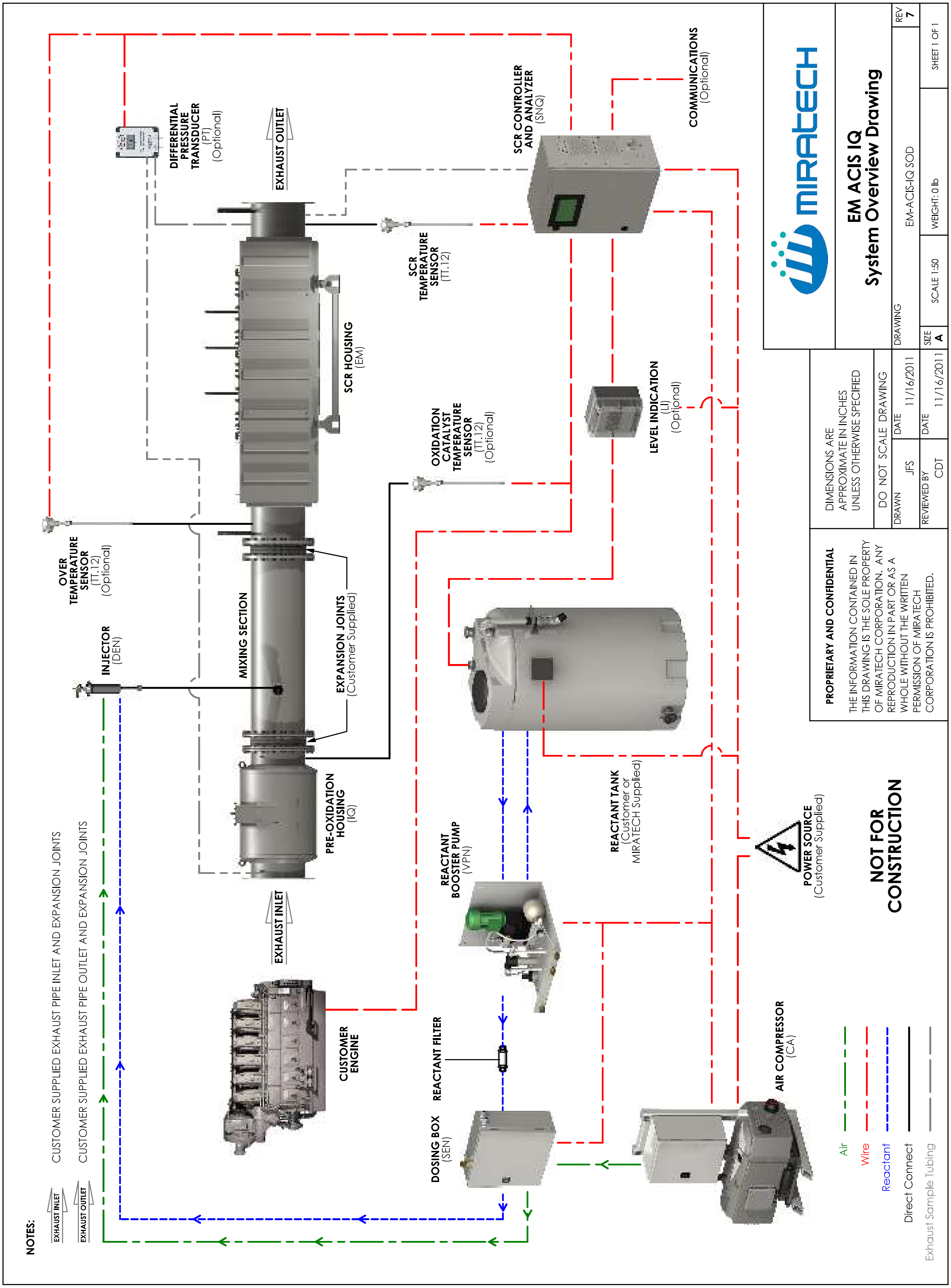
- Final catalyst housings are dependent on engine output and required emission reductions. Changes may be made to optimize the system design at the time of order.

- Any drawings included with this proposal are preliminary in nature and could change depending on final product selection.

- Any sound attenuation listed in this proposal is based on housing with catalyst elements installed.

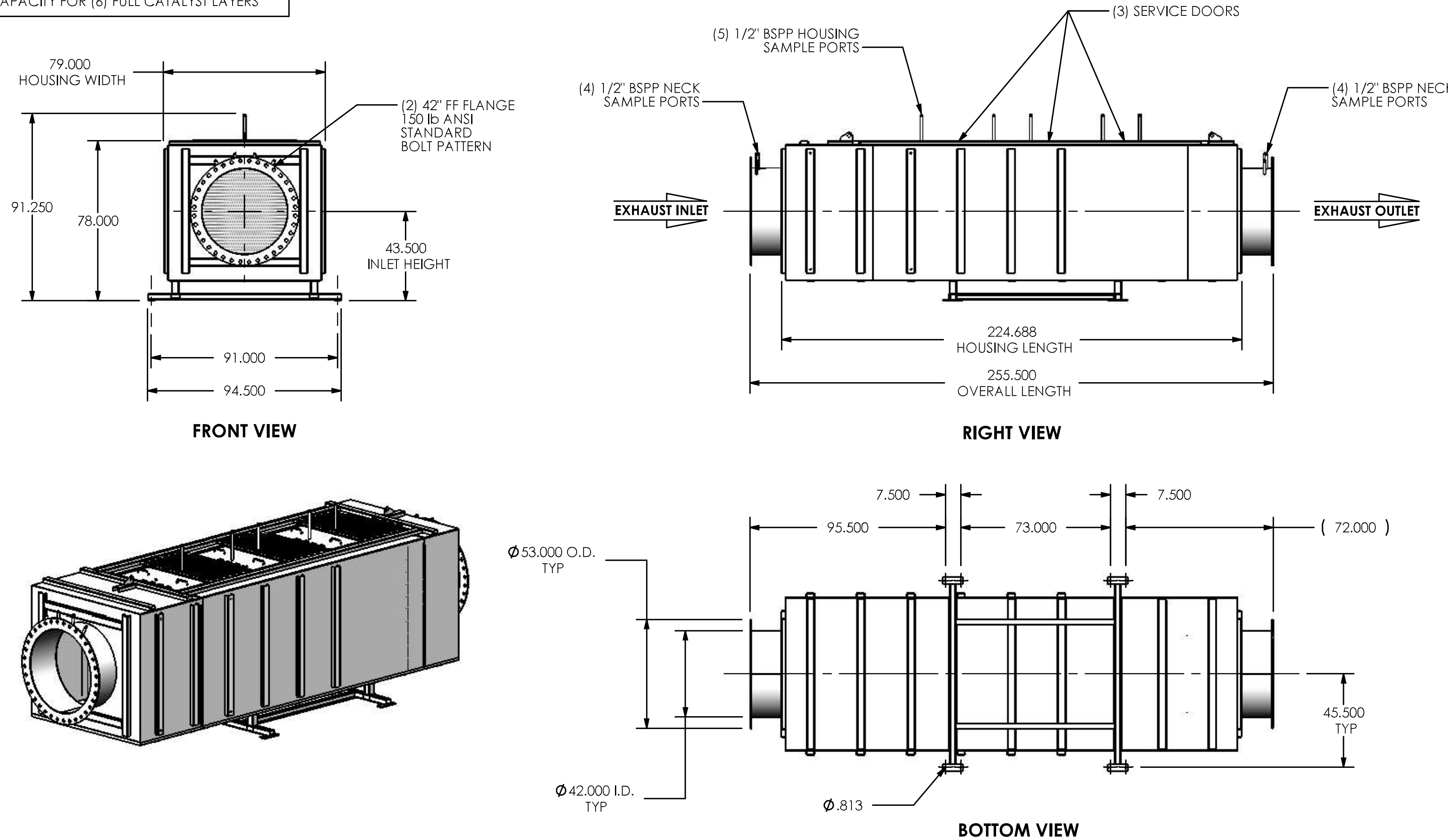
- Any emission reductions listed in this proposal are based on housing with catalyst elements installed.

- MIRATECH will confirm shipping location upon placement of order.



NOTES:
EXHAUST INLET
CUSTOMER SUPPLIED EXHAUST PIPE INLET AND EXPANSION JOINTS
EXHAUST OUTLET
CUSTOMER SUPPLIED EXHAUST PIPE OUTLET AND EXPANSION JOINTS
DIFFERENTIAL PRESSURE TRANSDUCER (PT) (Optional)
EXHAUST OUTLET
SCR CONTROLLER AND ANALYZER (SNQ)
COMMUNICATIONS (Optional)
SCR TEMPERATURE SENSOR (TT.12)
SCR HOUSING (EM)
OXIDATION CATALYST TEMPERATURE SENSOR (TT.12) (Optional)
LEVEL INDICATION (LI) (Optional)
OVER TEMPERATURE SENSOR (TT.12) (Optional)
INJECTOR (DEN)
MIXING SECTION
EXPANSION JOINTS (Customer Supplied)
PRE-OXIDATION HOUSING (IQ)
REACTANT BOOSTER PUMP (VPN)
REACTANT TANK (Customer or MIRATECH Supplied)
POWER SOURCE (Customer Supplied)
EXHAUST INLET
CUSTOMER ENGINE
REACTANT FILTER
DOSING BOX (SEN)
AIR COMPRESSOR (CA)
Air
Wire
Reactant
Direct Connect
Exhaust Sample Tubing
NOT FOR CONSTRUCTION
MIRATECH
EM ACIS IQ
System Overview Drawing
PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH CORPORATION. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH CORPORATION IS PROHIBITED.
DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED
DO NOT SCALE DRAWING
DRAWN JFS
DATE 11/16/2011
REVIEWED BY CDT
DATE 11/16/2011
DRAWING EM-ACIS-IQ SOD
REV 7
SIZE A
SCALE 1:50
WEIGHT: 0 lb
SHEET 1 OF 1

HOUSING WEIGHTS (APPROXIMATE)	
EMPTY HOUSING	9588 lb
ONE (1) FULL SCR CATALYST LAYER	1020 lb
FULLY LOADED HOUSING	15708 lb
• HOUSING HAS CAPACITY FOR (6) FULL CATALYST LAYERS	



NOTES:

- ONLY USE MOUNTING FEET TO LIFT ASSEMBLED HOUSING
- MUST BE MOUNTED HORIZONTALLY
- NO FORCES OR MOMENTS MAY BE APPLIED TO THE FLANGES
- ALLOW MINIMUM 40" CLEARANCE FROM SERVICE DOOR FOR LOADING AND MAINTENANCE

MATERIAL CONSTRUCTION:

- CARBON STEEL

PROJECT NAME	
PROPOSAL NUMBER	
SALES ORDER NO.	
CUSTOMER P.O.	

PROPRIETARY AND CONFIDENTIAL

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH CORPORATION. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH CORPORATION IS PROHIBITED.

DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED

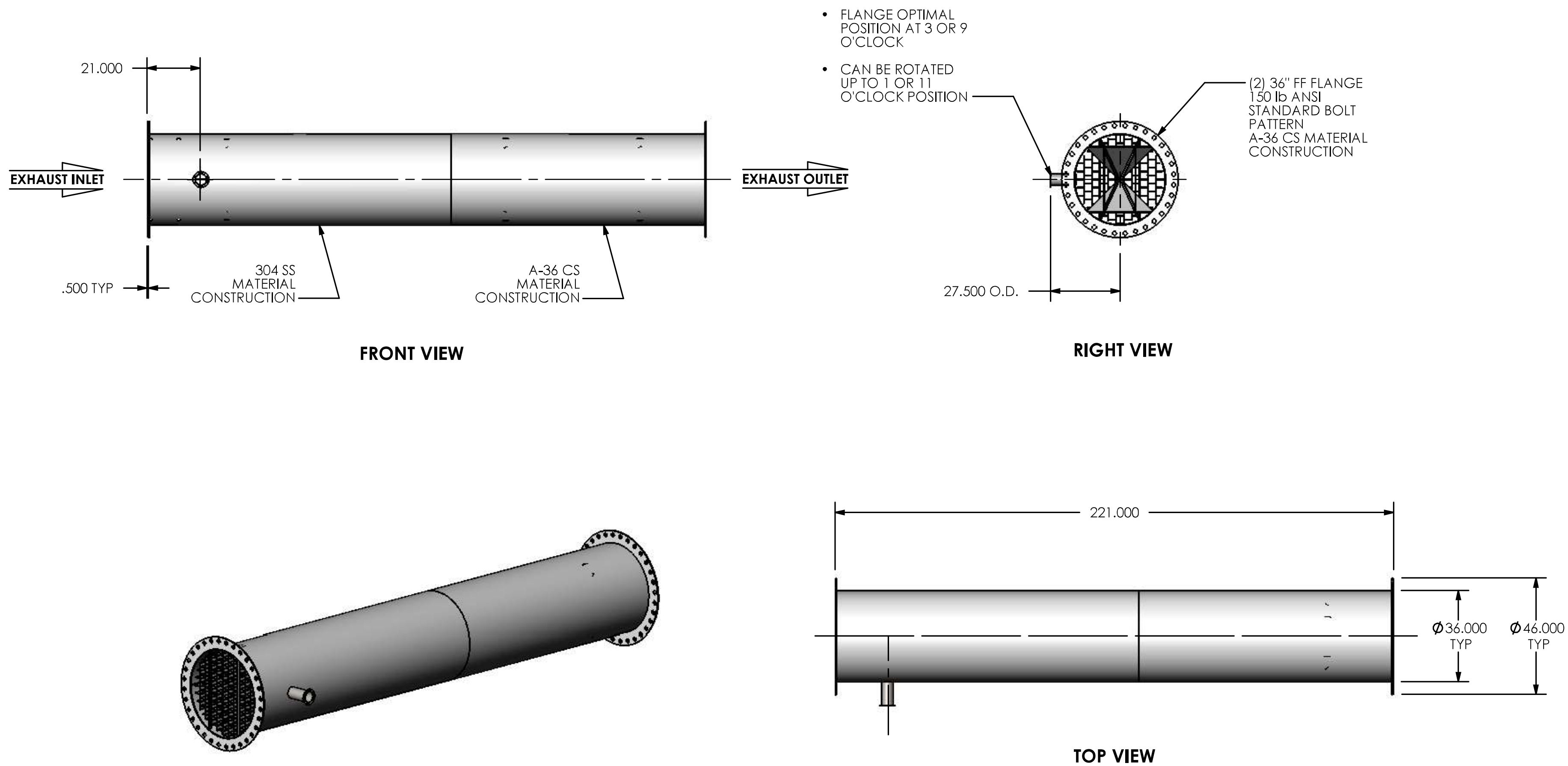
DO NOT SCALE DRAWING

DRAWN	DATE
JCU	3/12/2010
REVIEWED BY	DATE
AJM	3/12/2010

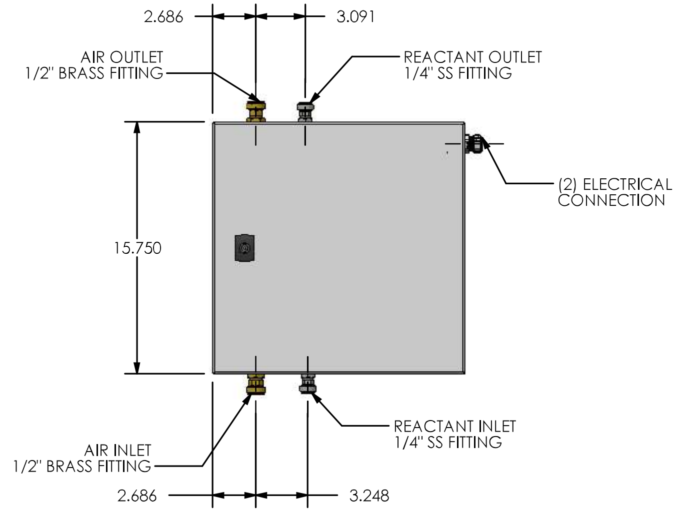
MIRATECH

EM120.180-42
Sales Drawing

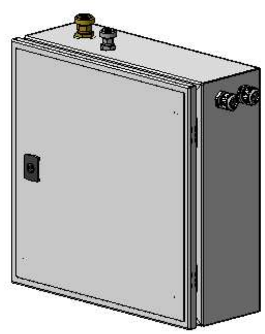
DRAWING			REV
EM120.180-42			0
SIZE A	SCALE 1:80	WEIGHT: 7302 lb	SHEET 1 OF 1

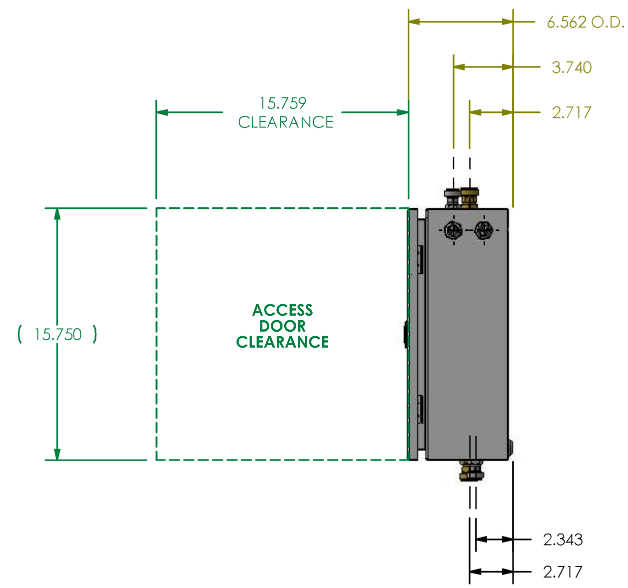


PROJECT NAME	**PROPRIETARY AND CONFIDENTIAL** THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH CORPORATION. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH CORPORATION IS PROHIBITED.	DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED		MIRATECH
PROPOSAL NUMBER		DO NOT SCALE DRAWING		**36" Mixing Section (3 Mixer) Sales Drawing**
SALES ORDER NO.		DRAWN AJM	DATE 1/5/2010	DRAWING 36 Mixing Section (3 Mixer) SD — REV **5**
CUSTOMER P.O.		REVIEWED BY JWS	DATE 1/5/2010	SIZE **A** — SCALE 1:65 — WEIGHT: 1405 lb — SHEET 1 OF 1

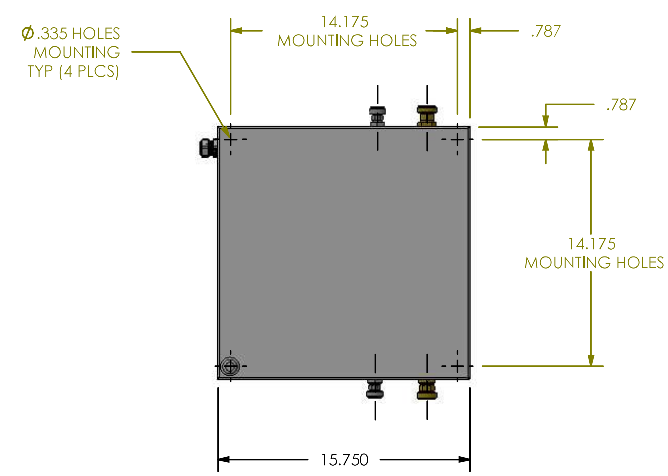


FRONT VIEW





RIGHT VIEW



BACK VIEW

NOTES:

- *POWER CONSUMPTION:* 5.75 W MAX
- *POWER:* SUPPLIED FROM SNQ CONTROLLER
- *OPERATION TEMPERATURE:* 40-104°F
  14-104°F (WITH .WT OPTION)
- NO DEW DROPS ALLOWED
- OPERATING PRESSURE: REACTANT - 3 BAR (43.50 PSI)
  AIR - 1 BAR (14.50 PSI)

INSTALLATION INSTRUCTIONS:

- IF UNIT IS INSTALLED IN AN ENCLOSURE, THE ENCLOSURE MUST BE VENTILATED AND TEMPERATURE CONTROLLED TO MAINTAIN PROPER OPERATION TEMPERATURE.
- UNIT TO BE MOUNTED SO THAT IT IS ACCESSIBLE WHILE ENGINE IS IN OPERATION AND NO MORE THAN 6.5 FEET FROM DOSING INJECTOR.
- UREA LINES SHOULD BE HEAT TRACED IF AMBIENT CONDITIONS FALL BELOW 40°F

PROJECT NAME	
PROPOSAL NUMBER	
SALES ORDER NO.	
CUSTOMER P.O.	

PROPRIETARY AND CONFIDENTIAL

DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED

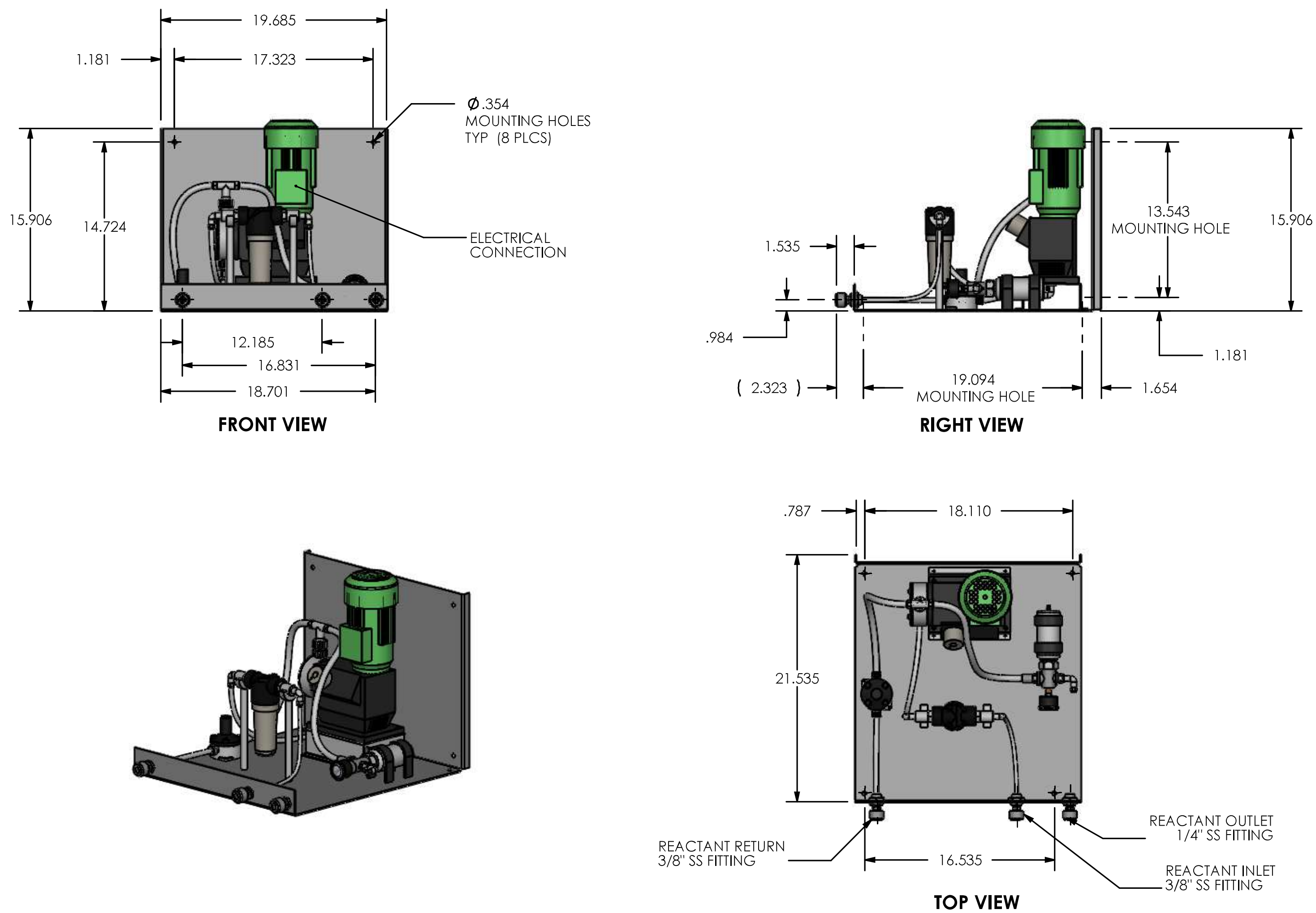
DO NOT SCALE DRAWING

DRAWN	DATE
JFS	08/22/2011
REVIEWED BY	DATE
AJM	08/22/2011

MIRATECH

SEN20 Dosing Box
Sales Drawing

DRAWING			REV
SEN20 SD			6
SIZE A	SCALE 1:12	WEIGHT: 27 lb	SHEET 1 OF 1



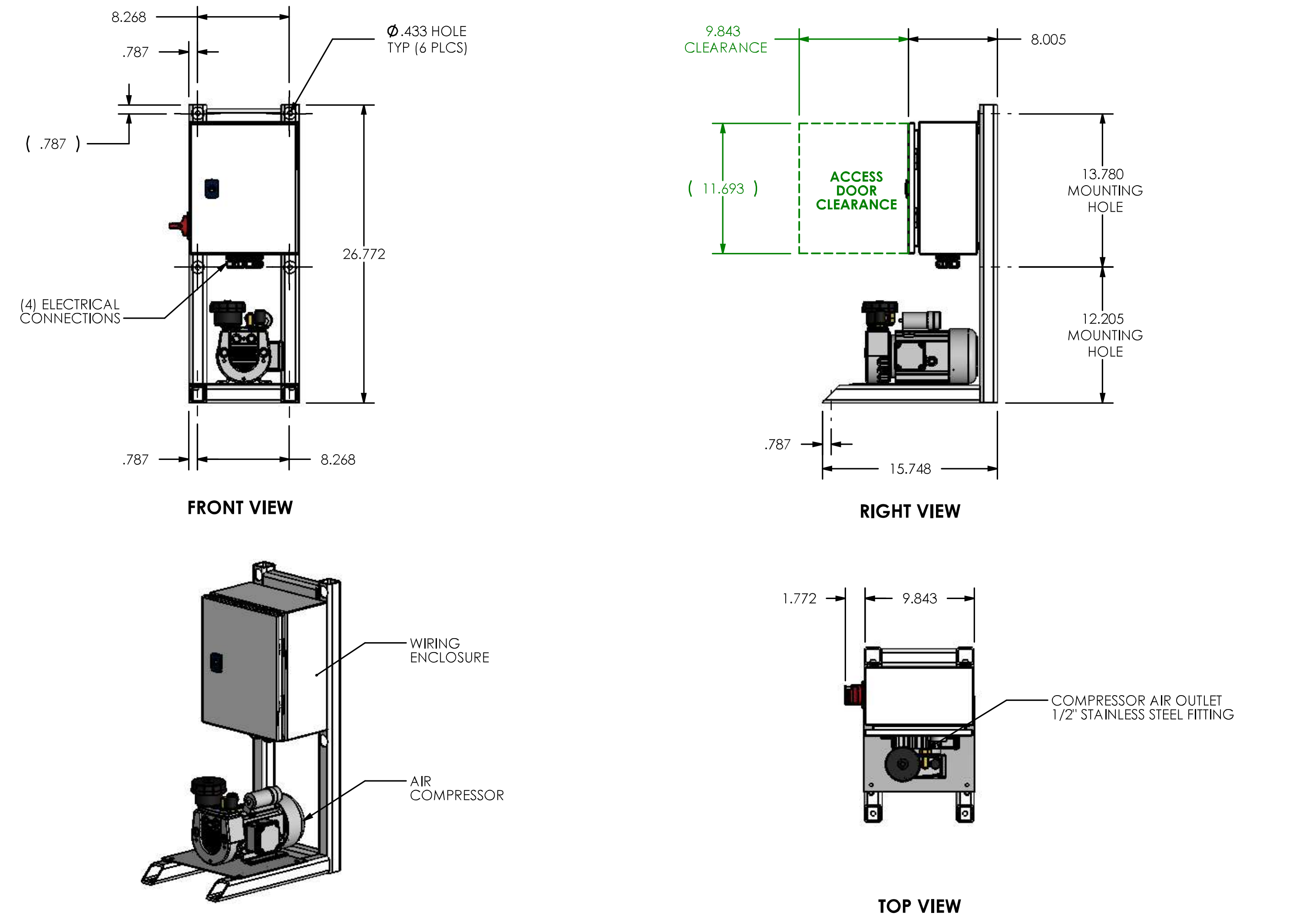
NOTES:

- *POWER CONSUMPTION:* 250 W MAX SUPPLIED BY SNQ CONTROLLER
- *OPERATION TEMPERATURE:* 40°F - 104°F

INSTALLATION INSTRUCTIONS:

- UNIT TO BE MOUNTED SO THAT THE MAXIMUM SUCTION HEIGHT IS LESS THAN 5 FEET
- UREA LINES SHOULD BE HEAT TRACED IF AMBIENT CONDITIONS FALL BELOW 40° F

PROJECT NAME	**PROPRIETARY AND CONFIDENTIAL** THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH GROUP, LLC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH GROUP, LLC IS PROHIBITED.	DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED	MIRATECH
PROPOSAL NUMBER		DO NOT SCALE DRAWING	**VPN20 Booster Pump Sales Drawing**
SALES ORDER NO.		DRAWN CLV — DATE 11/11/2015	DRAWING VPN20 SD — REV 8
CUSTOMER P.O.		REVIEWED BY EQJ — DATE 11/11/2015	SIZE A — SCALE 1:15 — WEIGHT: 101 lb — SHEET 1 OF 1



NOTES:

- *POWER CONSUMPTION:* 420 W MAX
- *VOLTAGE:* 230 VAC +/- 10%, SINGLE Φ, 60 Hz
- *CURRENT DRAW:* 3.40 A
- OPERATION TEMPERATURE: 32°F - 104°F

INSTALLATION INSTRUCTIONS:

- IF UNIT IS INSTALLED IN AN ENCLOSURE, THE ENCLOSURE MUST BE VENTILATED AND TEMPERATURE CONTROLLED TO MAINTAIN PROPER OPERATION TEMPERATURE

PROJECT NAME	
PROPOSAL NUMBER	
SALES ORDER NO.	
CUSTOMER P.O.	

PROPRIETARY AND CONFIDENTIAL

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH CORPORATION. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH CORPORATION IS PROHIBITED.

DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED

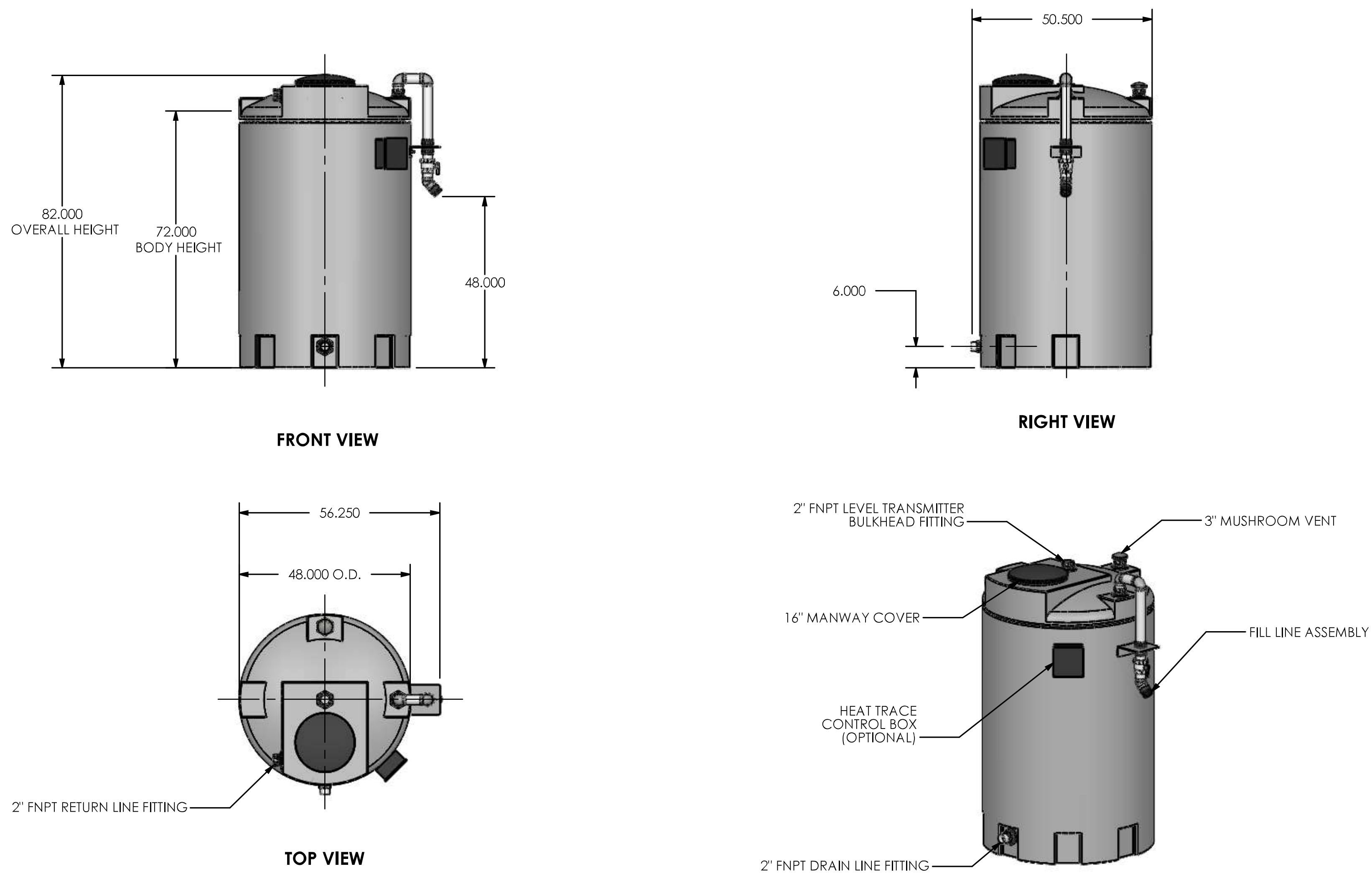
DO NOT SCALE DRAWING

DRAWN	DATE
JFS	08/22/2011
REVIEWED BY	DATE
AJM	08/22/2011

MIRATECH

CA20 Air Compressor Sales Drawing

DRAWING			REV
CA20 SD			6
SIZE A	SCALE 1:15	WEIGHT: 64 lb	SHEET 1 OF 1



NOTES:

- CAPACITY: 500 (US GALLONS)
- INSULATION NOT SHOWN - NOMINAL 2" THICKNESS W/ GRAY MASTIC COATING
- (OPTIONAL) SEISMIC TIE DOWNS ARE RATED UBC ZONE 4
- *MATERIAL CONSTRUCTION:* CROSSLINK POLYETHYLENE
- HEAT TRACE ELECTRICAL REQUIREMENTS
  - POWER CONSUMPTION: 210W
  - CURRENT DRAW: 1.75A
  - SUPPLY VOLTAGE: 120 VAC, 1 Ø

PROJECT NAME	**PROPRIETARY AND CONFIDENTIAL** THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MIRATECH CORPORATION. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MIRATECH CORPORATION IS PROHIBITED.	DIMENSIONS ARE APPROXIMATE IN INCHES UNLESS OTHERWISE SPECIFIED DO NOT SCALE DRAWING	MIRATECH **SW550 Reactant Tank Sales Drawing**
PROPOSAL NUMBER		DRAWN JFS / DATE 08/28/2012	DRAWING SW550 SD / REV 7
SALES ORDER NO.		REVIEWED BY AJM / DATE 08/28/2012	SIZE A / SCALE 1:45 / WEIGHT: 130 lb / SHEET 1 OF 1
CUSTOMER P.O.			

Reference Proposal NEW-20-002213 R4 03-08-2021

In the absence of engine and site specific emissions data, emissions factors are taken from either EPA Report AP-42 Section 3.2 or California Air Toxics Emissions factor database. For these values the nominal Destruction/Removal Efficiencies (DREs) for the various HAPs are reported under the conditions used for the control of CO, formaldehyde, and NMNEHC from that type of engine.

Stationary and Portable Internal Combustion Engines			EF in [lb/M gal]		
POLLUTANT	**CAS**	**MW**	**All Sizes**		**DRE**
Benzene	71-43-2	78.11	0.1863	OxiCat	75
1,3-Butadiene	106-99-0	54.09	0.2174	OxiCat	80
Acetaldehyde	75-07-0	44.05	0.7833	OxiCat	75
Acrolein	107-02-8	56.06	0.0339	OxiCat	80
Ethylbenzene	100-41-4	106.17	0.0109	OxiCat	60
Hexane	110-54-3	86.18	0.0269	OxiCat	40
Toluene	108-88-3	92.14	0.1054	OxiCat	65
Xylene (mixture), including m-o-p- Xylene	1330-20-7	106.16	0.0424	OxiCat	65
Methanol				OxiCat	70
Methane				OxiCat	5

ATTACHMENT N: SUPPORTING EMISSIONS CALCULATIONS

WVM Pleasants County Methanol Plant

Overall Plant	Major Pollutants, tpy							
Process	PM	PM10	PM2.5	SO2	NOx	CO	VOC	HAP
SMR Normal	13.22	13.22	13.22	1.83	39.81	24.24	13.22	1.51
SMR SSM Events	0.22	0.22	0.17	0.00	0.45	0.45	0.49	0.06
Flare SSM Events	0.94	0.94	0.71	0.00	3.57	27.35	0.48	0.32
Flare Normal	0.01	0.01	0.01	0.00	0.26	1.08	0.02	0.01
Power Plant	3.50	3.50	3.50	0.61	48.89	38.58	29.37	15.72
Subtotal Point Sources	17.89	17.89	17.60	2.45	92.98	91.70	43.59	17.61
Equipment Leaks	--	--	--	--	--	0.06	5.87	5.85
Haul Road	1.20	0.24	0.06	--	--	--	--	--
Subtotal Fugitive	1.20	0.24	0.06	0	0	0.06	5.87	5.85
Total Plant	**19.10**	**18.13**	**17.66**	**2.45**	**92.98**	**91.76**	**49.45**	**23.46**

PER Emissions Point	Major Pollutants, tpy							
	PM	PM10	PM2.5	SO2	NOx	CO	VOC	HAP
SMR Flue Gas Stack	4.48	4.48	4.46	0.611	13.42	8.23	4.57	0.523
Flare	0.32	0.32	0.24	0.001	1.28	9.48	0.17	0.108
Engine	0.50	0.50	0.50	0.087	6.98	5.51	4.20	2.246

Overall Plant	HAP, tpy					
	RICE	SMR	SSM	LP Flare	Fugitive	Totals
Acetaldehyde	2.818	0	0	0	0	2.82
Acrolein	1.399	0	0		0	1.40
Formaldehyde	8.146	0.0211	3.66E-03	0.00027	0	8.17
Methanol	0.953	0.98	3.07E-01	0	5.85	8.09
n-Hexane	0.785	0.5065	6.24E-02	0.006	0	1.36
Naphthalene	0.081	0.0002	2.98E-05	2.2E-06	0	0.08
Total						21.92

SMR - HTCR Emissions Per Unit

OPERATING PARAMETERS

SMR Combustion Basis	STM 2944	STM 2936			PD - Process Design Case C11
MDHI/(PDHI)	1.1	1.1	1.1		MDHI - Max Design Heat Input; PDHI - Process Design Heat Input
CASE	**MB**	**DB**	**Total**		MB - Main Burner; DB - Duct Burner
Operating Schedule	8,760	8760	8760		hrs/yr
Fuels					Purge Gas
Fuel Flow, SCFH	447,123	55,318	502,440		
Heat Input, HHV MMBtu/h	206.57	25.56	232.13		
Fuel HHV, Btu/SCF	462	462	462		

PURGE GAS COMPOSITION	**SCFM**	**SCFM**	**SCFM**	**SCFH**	
C_2H_6					
CH_3OH	49.5	6.6	56	3,366	
CH_4	1575.2	194.7	1,770	106,194	
CO	75.9	9.9	86	5,148	
CO2	192.5	24.2	217	13,002	
H2	5515.4	682	6,197	371,844	
Higher Alcohols					
N2	34.1	4.4	39	2310	
O2					
H20	8.8	1.1	10	594	
Total Gas Flow to Burners	7451.4	922.9	8374.3	502458	
MOLECULAR WEIGHT	6.67	6.67	6.67	6.67	lb/lbmol
Maximum CH3OH Content	74.5	9.2	83.7	5025	Allowance for 1% Maximum in Purge Gas

FLUE GAS COMPOSITION to SCR — **CASE** STM 2788

	MW	**Mol, %**	**lb/h**	**SCFM**	**Nm3/hr**	**Nm3/hr**
Argon	39.948	0.82%	3,927	622	1,001	1,001
Carbon Dioxide	44.01	2.83%	14,946	2,148	3,459	3,459
Nitrogen	28.02	67.95%	228,776	51,652	83,159	83,159
Exhaust O2	32	9.36%	36,004	7,116	11,457	3,671
Exhaust, H20	18	19.04%	41,235	14,476	23,306	0
Total			324,887	76,013	122,381	91,290
MOLECULAR WEIGHT	27.03					
Maximum CH3OH Content			0.07475906	0.0083743		

EMISSIONS DESIGN BASIS - SMR Normal

Criteria Pollutant Associated with Purge Gas

Pollutant	**MW**		**mg/Nm3**	**lb/MMBtu**	**PPM**	**DRE**	**Source**	**Emissions Basis**
PM10			5				Haldor Topsoe	
PM2.5			5				Haldor Topsoe	
SO2				0.0006			AP42, Table 1.4-2	
NOx	46.0055	pre-SCR	150		79.7		Haldor Topsoe	150 mg/Nm3, (dry, 3% O2)
NOx		post-SCR	15.05		8	90.0%	HT w/ margin	5 ppm, (dry, 3% O2) + 3 ppm
CO	28.0101	pre-Oxy Cat	16.6		14.5		Haldor Topsoe	
		post-Oxy Cat	9.16		8	44.8%	HT w/ margin	5 ppm, (dry, 3% O2) + 3 ppm
VOC	13.875389	pre-Oxy Cat	5		8.8		Haldor Topsoe	
	13.875389	post-Oxy Cat	5		8.8	0.0%		Margin of DRE set to 0 for VOC
Pb				0.00000103			AP42, Table 1.4-2	
N2O		GWP 298		0.00454			AP42, Table 1.4-5	
NH3	17.031		3.48		5		Haldor Topsoe	3 ppm, (dry, 3% O2) + 2 ppm
CH3OH						99.99%	EPA530-r-97-047, Section 2.2	

SMR EMISSIONS CALCULATIONS PER UNIT

POLUTANT	**lb/hr**	**mg/h**	**kg/h**	**tpy**	**Per Plant**
PM	1.0063	456,449	0.456	4.41	13.22
PM10	1.0063	456,449	0.456	4.41	13.22
PM2.5	1.0063	456,449	0.456	4.41	13.22
SO2	0.1393			0.61	1.83
Nox (pre-SCR)	30.1889	13,693,484	13.693	132.23	396.68
Nox (post-controlled)	3.0296	1,374,187	1.374	13.27	39.81
CO (pre OXY-CAT)	3.3409	1,515,412	1.515	14.63	43.90
CO (post-controlled)	1.8445	836,663	0.837	8.08	24.24
VOC (pre OXY-CAT)	1.0063	456,449	0.456	4.41	13.22
VOC (post-controlled)	1.0063	456,452	0.456	4.41	13.22
Pb	0.0002			0.00	0.00
N2O	1.0539			4.62	13.85
NH3	0.7010	317,948	0.318	3.07	9.21
CH3OH (HAP)	0.0748			0.33	0.98

SMR EMISSIONS CALCULATIONS PER UNIT - Continued

Annual Emissions, TPY	Per Unit	Plant
PM	4.41	13.22
PM10	4.41	13.22
PM2.5	4.41	13.22
SO2	0.61	1.83
Nox (pre-SCR)	132.23	396.68
Nox (post-controlled)	13.27	39.81
CO (pre OXY-CAT)	14.63	43.90
CO (post-controlled)	8.08	24.24
VOC (pre OXY-CAT)	4.41	13.22
VOC (post-controlled)	4.41	13.22
Pb	0.001	0.00
N2O	4.62	13.85
NH3	3.07	9.21
CH3OH (HAP)	0.33	0.98

HAP Methanol Vapor + NG Trim

	lb/h Unit	TPY Unit	TPY Plant
CH3OH (HAP)	7.48E-02	0.33	0.98
Normal Trim NG	4.04E-02	1.77E-01	0.5312
Total SMR Normal	0.1152	0.5045	1.5136

SMR Normal Operation - Potential Impact to HAPS using PNG for Trimming
OPERATING PARAMETERS

Normal Operations

Operating Schedule	8760	hrs/yr	
Natural Gas HHV	1,084	Btu/scf	
Heat Duty	232.13	MMBtu/h	PD - Process Design Case C11 times MDHI/PDHI
Trim Gas to Burners	10	percent	By Burner Heat Content
Total Trim Gas Heat Input	23.2	MMBtu/h	
Annual Maximum Trim Gas Amount	203,344	MMBtu/yr	Note Trim Gas is likely to be 5% or less but basis for HAPS is maximum

SMR Normal Operation Case - HAPS Contribution from Using NG for Trim Control

TOTAL SPECIATED POLLUTANT EMISSIONS SUMMARY[1]					Unit	Plant
		lb/MMscf	lb/MMBtu	lb/hr	tpy	tpy
HAP	Total	1.89E+00	1.74E-03	4.04E-02	1.771E-01	5.312E-01
Organic HAP Speciation						
	n-hexane	1.80E+00	1.66E-03	3.85E-02	1.69E-01	5.065E-01
	formaldehyde	7.50E-02	6.92E-05	1.61E-03	7.03E-03	2.110E-02
	toluene	3.40E-03	3.14E-06	7.28E-05	3.19E-04	9.567E-04
	benzene	2.10E-03	1.94E-06	4.50E-05	1.97E-04	5.909E-04
	dichlorobenzene	1.20E-03	1.11E-06	2.57E-05	1.13E-04	3.377E-04
	naphthalene	6.10E-04	5.63E-07	1.31E-05	5.72E-05	1.716E-04
POM Speciation						
	total POM	8.82E-05	8.14E-08	1.89E-06	8.27E-06	2.482E-05
	2-methylnaphthalene	2.40E-05	2.21E-08	5.14E-07	2.25E-06	6.753E-06
	phenanthrene	1.70E-05	1.57E-08	3.64E-07	1.59E-06	4.783E-06
	7,12-dimethylbenz(a)anthracene	1.60E-05	1.48E-08	3.43E-07	1.50E-06	4.502E-06
	pyrene	5.00E-06	4.61E-09	1.07E-07	4.69E-07	1.407E-06
	benzo(b,k)fluoranthene	3.60E-06	3.32E-09	7.71E-08	3.38E-07	1.013E-06
	fluoranthene	3.00E-06	2.77E-09	6.42E-08	2.81E-07	8.441E-07
	fluorene	2.80E-06	2.58E-09	6.00E-08	2.63E-07	7.879E-07
	anthracene	2.40E-06	2.21E-09	5.14E-08	2.25E-07	6.753E-07
	acenaphthene	1.80E-06	1.66E-09	3.85E-08	1.69E-07	5.065E-07
	acenaphthylene	1.80E-06	1.66E-09	3.85E-08	1.69E-07	5.065E-07
	benz(a)anthracene	1.80E-06	1.66E-09	3.85E-08	1.69E-07	5.065E-07
	chrysene	1.80E-06	1.66E-09	3.85E-08	1.69E-07	5.065E-07
	indeno(1,2,3-cd)pyrene	1.80E-06	1.66E-09	3.85E-08	1.69E-07	5.065E-07
	3-methylchloranthene	1.80E-06	1.66E-09	3.85E-08	1.69E-07	5.065E-07
	benzo(a)pyrene	1.20E-06	1.11E-09	2.57E-08	1.13E-07	3.377E-07
	benzo(g,h,i)perylene	1.20E-06	1.11E-09	2.57E-08	1.13E-07	3.377E-07
	dibenzo(a,h)anthracene	1.20E-06	1.11E-09	2.57E-08	1.13E-07	3.377E-07
Inorganic HAP Speciation						
	nickel	2.10E-03	1.94E-06	4.50E-05	1.97E-04	5.909E-04
	chromium	1.40E-03	1.29E-06	3.00E-05	1.31E-04	3.939E-04
	cadmium	1.10E-03	1.01E-06	2.36E-05	1.03E-04	3.095E-04
	manganese	3.80E-04	3.51E-07	8.14E-06	3.56E-05	1.069E-04
	mercury	2.60E-04	2.40E-07	5.57E-06	2.44E-05	7.316E-05
	arsenic	2.00E-04	1.85E-07	4.28E-06	1.88E-05	5.628E-05
	cobalt	8.40E-05	7.75E-08	1.80E-06	7.88E-06	2.364E-05
	selenium	2.40E-05	2.21E-08	5.14E-07	2.25E-06	6.753E-06
	beryllium	1.20E-05	1.11E-08	2.57E-07	1.13E-06	3.377E-06
	Total HAP	1.89E+00	0.001742	0.040429	1.77E-01	5.312E-01

[1]Emission factors in EPA AP-42, Section 1.5, “Natural Gas Combustor”, July 1998

ESTIMATED EMISSIONS PER SSM EVENT

SSM EVENT EMISSIONS - TPY PER UNIT											
Component	CS	CS	CS	SLT	SLT	SLT	RTR	RTR	RTR	SD	SD
	Flare	HTCR	Total	Flare	HTCR	Total	Flare	HTCR	Total	Flare	Total
	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons
1-Butanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1-Pentanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1-Propanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2,2-Dimethylpropane	0.000	0.005	0.005	0.000	0.002	0.002	0.000	0.003	0.003	0.000	0.000
2-Butanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2-Methyl-1-Propanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2-Methylbutane	0.000	0.005	0.005	0.000	0.002	0.002	0.000	0.003	0.003	0.000	0.000
2-Propanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acetone	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-	0.000
Argon	0.000	42.520	42.520	0.000	9.554	9.554	0.000	22.021	22.021	-	0.000
Carbon Dioxide	289.6	201.7	491.3	157.5	68.4	225.9	203.5	115.6	319.1	4.217	4.2
Carbon Monoxide	1.184	0.026	1.210	1.246	0.009	1.255	0.898	0.015	0.913	0.023	0.023
Dimethyl Ether	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethane	0.030	0.005	0.036	0.000	0.002	0.002	0.018	0.003	0.021	0.001	0.001
Ethanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Formic Acid	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hydrogen	0.337	0.000	0.337	0.369	0.000	0.369	0.254	0.000	0.254	0.006	0.006
i-Butane	0.002	0.004	0.005	0.000	0.001	0.001	0.001	0.002	0.003	0.000	0.000
Methane	1.556	0.004	1.560	0.358	0.002	0.360	0.990	0.002	0.992	0.026	0.026
Methanol	0.019	0.000	0.019	0.006	0.000	0.006	0.007	0.000	0.007	0.001	0.001
Methyl Ethyl Ketone	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-	0.000
Methyl Formate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nitrogen	1.300	2472	2473	0.448	556	556	0.553	1280	1281	1.118	1.118
Oxygen	0.000	472.8	472.8	0.000	73.184	73.184	0.000	229	229	-	0.000
Propane	0.006	0.003	0.008	0.000	0.001	0.001	0.003	0.002	0.005	0.000	0.000
Water	0.623	302.5	303.2	0.813	86.495	87.308	0.624	165.6	166.3	0.079	0.079
n-Butane	0.002	0.004	0.005	0.000	0.001	0.001	0.001	0.002	0.003	0.000	0.000
n-Heptane	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
n-Hexane	0.001	0.003	0.004	0.000	0.001	0.001	0.000	0.002	0.002	0.000	0.000
n-Pentane	0.000	0.005	0.005	0.000	0.002	0.002	0.000	0.003	0.003	0.000	0.000
Hydrogen Sulfide	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2-Methylnaphthalene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3-Methylcholanthrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2-Dimethylbenz(a)anthrace	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acenaphthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acenaphthylene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benz(a)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(a)pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(b)fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(g,h,i)perylene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(k)fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Chrysene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dibenzo(a,h)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dichlorobenzene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Formaldehyde	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Toluene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sulfur Dioxide	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total VOC	0.029	0.028	0.057	0.007	0.010	0.016	0.013	0.016	0.029	0.001	0.001
NOx	0.182	0.027	0.209	0.103	0.006	0.109	0.124	0.014	0.137	0.003	0.003
PM10	0.043	0.013	0.056	0.037	0.004	0.041	0.032	0.007	0.039	0.001	0.001
PM2.5	0.033	0.010	0.042	0.028	0.003	0.031	0.024	0.006	0.029	0.001	0.001
Ammonia	0.000	0.011	0.011	0.000	0.002	0.002	0.000	0.006	0.006	-	0.000

SSM EVENT EMISSIONS - TPY PER OVERALL PLANT											
Component	CS	CS	CS	SLT	SLT	SLT	RTR	RTR	RTR	SD	SD
	Flare	HTCR	Total	Flare	HTCR	Total	Flare	HTCR	Total	Flare	Total
	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons
1-Butanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1-Pentanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1-Propanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2,2-Dimethylpropane	0.001	0.015	0.016	0.000	0.005	0.005	0.001	0.008	0.009	0.000	0.000
2-Butanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2-Methyl-1-Propanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2-Methylbutane	0.000	0.015	0.015	0.000	0.005	0.005	0.000	0.008	0.009	0.000	0.000
2-Propanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acetone	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Argon	0.0	127.6	127.6	0.0	28.7	28.7	0.0	66.1	66.1	0.0	0.0
Carbon Dioxide	869	605	1,474	472	205	678	611	347	957	13	13
Carbon Monoxide	3.553	0.077	3.630	3.739	0.026	3.765	2.694	0.044	2.739	0.068	0.068
Dimethyl Ether	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethane	0.091	0.016	0.107	0.001	0.005	0.006	0.055	0.009	0.064	0.003	0.003
Ethanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Formic Acid	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hydrogen	1.011	0.000	1.011	1.108	0.000	1.108	0.763	0.000	0.763	0.017	0.017
i-Butane	0.005	0.011	0.015	0.000	0.004	0.004	0.003	0.006	0.009	0.000	0.000
Methane	4.668	0.012	4.680	1.074	0.005	1.079	2.969	0.007	2.976	0.077	0.077
Methanol	0.056	0.000	0.056	0.019	0.000	0.019	0.020	0.000	0.020	0.002	0.002
Methyl Ethyl Ketone	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Methyl Formate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nitrogen	3.9	7,416.6	7,420.5	1.3	1,666.6	1,668.0	1.7	3,841.2	3,842.9	3.4	3.4
Oxygen	0.0	1,418.3	1,418.3	0.0	219.6	219.6	0.0	686.7	686.7	0.0	0.0
Propane	0.017	0.008	0.025	0.000	0.004	0.004	0.010	0.005	0.015	0.001	0.001
Water	1.87	907.59	909.45	2.44	259.49	261.92	1.87	496.88	498.75	0.24	0.24
n-Butane	0.005	0.011	0.015	0.000	0.004	0.004	0.003	0.006	0.009	0.000	0.000
n-Heptane	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
n-Hexane	0.002	0.009	0.011	0.000	0.003	0.003	0.001	0.005	0.006	0.000	0.000
n-Pentane	0.001	0.015	0.016	0.000	0.005	0.005	0.001	0.008	0.009	0.000	0.000
Hydrogen Sulfide	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2-Methylnaphthalene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3-Methylcholanthrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7,12-Dimethylbenz(a)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acenaphthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acenaphthylene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benz(a)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(a)pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(b)fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(g,h,i)perylene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(k)fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Chrysene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dibenzo(a,h)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dichlorobenzene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fluorene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Formaldehyde	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Indeno(1,2,3-cd)pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Phenanathrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Toluene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sulfur Dioxide	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
Total VOC	0.087	0.083	0.170	0.020	0.029	0.049	0.039	0.048	0.086	0.004	0.004
NOx	0.545	0.082	0.626	0.308	0.019	0.327	0.371	0.041	0.412	0.009	0.009
PM10	0.130	0.038	0.169	0.111	0.013	0.124	0.095	0.022	0.117	0.002	0.002
PM2.5	0.098	0.029	0.127	0.083	0.010	0.093	0.071	0.017	0.088	0.002	0.002
Ammonia	0.000	0.032	0.032	0.000	0.007	0.007	0.000	0.017	0.017	0.000	0.000
HAPS	0.058	0.010	0.067	0.019	0.003	0.022	0.021	0.005	0.026	0.002	0.002

BASIS OF SSM COMINATION EVENTS

SSM CASE Evaluation	Base Case
Description	**Combinations**
Startup	4
Shudown	4
Synloop Trip	2
Reformer Trip & Rest	2

ESTIMATED EMISSIONS FOR SELECTED COMINATION OF VARIOUS SSM CASES PER OVERALL PLANT

SSM COMBINATION EMISSIONS		Base Case	
Constituent	Base Case	Flare	HTCR
	Flare+HTCR	Base	Base
	tons	tons	tons
1-Butanol	0.000	0.000	0.000
1-Pentanol	0.000	0.000	0.000
1-Propanol	0.000	0.000	0.000
2,2-Dimethylpropane	0.093	0.007	0.085
2-Butanol	0.000	0.000	0.000
2-Methyl-1-Propanol	0.000	0.000	0.000
2-Methylbutane	0.087	0.002	0.085
2-Propanol	0.000	0.000	0.000
Acetone	0.000	0.000	0.000
Argon	699.7	0.000	700
Carbon Dioxide	9,217	5,692	3524
Carbon Monoxide	27.798	27.350	0.448
Dimethyl Ether	0.002	0.002	0.000
Ethane	0.576	0.485	0.091
Ethanol	0.000	0.000	0.000
Formic Acid	0.000	0.000	0.000
Hydrogen	7.856	7.856	0.000
i-Butane	0.087	0.025	0.062
Methane	27.140	27.067	0.073
Methanol	0.307	0.307	0.000
Methyl Ethyl Ketone	0.000	0.000	0.000
Methyl Formate	0.003	0.003	0.000
Nitrogen	40,717	35.023	40682
Oxygen	7,486	0.000	7486
Propane	0.144	0.093	0.051
Water	5,160	17.043	5143
n-Butane	0.089	0.027	0.062
n-Heptane	0.002	0.002	0.000
n-Hexane	0.062	0.009	0.053
n-Pentane	0.092	0.007	0.085
Hydrogen Sulfide	0.000	0.000	0.000
2-Methylnaphthalene	0.000	0.000	0.000
3-Methylcholanthrene	0.000	0.000	0.000
7,12-Dimethylbenz(a)anthracene	0.000	0.000	0.000
Acenaphthene	0.000	0.000	0.000
Acenaphthylene	0.000	0.000	0.000
Anthracene	0.000	0.000	0.000
Benz(a)anthracene	0.000	0.000	0.000
Benzene	0.000	0.000	0.000
Benzo(a)pyrene	0.000	0.000	0.000
Benzo(b)fluoranthene	0.000	0.000	0.000
Benzo(g,h,i)perylene	0.000	0.000	0.000
Benzo(k)fluoranthene	0.000	0.000	0.000
Chrysene	0.000	0.000	0.000
Dibenzo(a,h)anthracene	0.000	0.000	0.000
Dichlorobenzene	0.000	0.000	0.000
Fluoranthene	0.000	0.000	0.000
Fluorene	0.000	0.000	0.000
Formaldehyde	0.004	0.001	0.002
Indeno(1,2,3-cd)pyrene	0.000	0.000	0.000
Naphthalene	0.000	0.000	0.000
Phenanathrene	0.000	0.000	0.000
Pyrene	0.000	0.000	0.000
Toluene	0.000	0.000	0.000
Sulfur Dioxide	0.006	0.002	0.004
Total VOC	0.969	0.482	0.486
NOx	4.019	3.572	0.447
PM10	1.166	0.942	0.224
PM2.5	0.878	0.709	0.168
Ammonia	0.176	0.000	0.176
HAPS	0.373	0.317	0.055

Summary of SSM Plant Emissions for selected SSM Combination Events				
Emission	PLANT, tpy		Flare, tpy	HTCR, tpy
PM	1.17		0.94	0.224
PM10	1.17		0.94	0.224
PM2.5	0.88		0.71	0.168
SO2	0.01		0.002	0.004
Nox	4.02		3.57	0.447
CO	27.80		27.35	0.448
VOC	0.97		0.48	0.486
HAP	0.37		0.32	0.055

ESTIMATED EMISSIONS DURING A COLD STARTUP EVENT

FLARE EMISSIONS

Component	Max Hourly Emissions for Cold Startup				Total Emissions / Cold Startup			
	Pre-Treatment		Post-Treatment		Pre-Treatment		Post-Treatment	
	lb/hr	tons/hr	lb/hr	tons/hr	lbm	tons	lbm	tons
1-Butanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1-Pentanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1-Propanol	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
2,2-Dimethylpropane	4.997	0.002	0.100	0.000	45.805	0.023	0.923	0.000
2-Butanol	0.001	0.000	0.000	0.000	0.002	0.000	0.000	0.000
2-Methyl-1-Propanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2-Methylbutane	0.000	0.000	0.004	0.000	0.000	0.000	0.111	0.000
2-Propanol	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
Acetone	0.243	0.000	0.005	0.000	0.582	0.000	0.012	0.000
Argon	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Carbon Dioxide	15,683	7.842	48,418	24.209	91,683	45.841	579,228	289.614
Carbon Monoxide	8,584	4.292	290.061	0.145	35,677	17.838	2,369	1.184
Dimethyl Ether	3.077	0.002	0.062	0.000	7.910	0.004	0.158	0.000
Ethane	322.8	0.161	6.497	0.003	2959	1.479	60.555	0.030
Ethanol	0.002	0.000	0.000	0.000	0.006	0.000	0.000	0.000
Formic Acid	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hydrogen	3890.4	1.945	77.808	0.039	33,714	16.857	674.3	0.337
i-Butane	16.102	0.008	0.326	0.000	148	0.074	3.087	0.002
Methane	10,377	5.189	207.9	0.104	154,905	77.452	3112.2	1.556
Methanol	494	0.247	9.880	0.005	1,857	0.928	37.137	0.019
Methyl Ethyl Ketone	0.002	0.000	0.000	0.000	0.005	0.000	0.000	0.000
Methyl Formate	5.239	0.003	0.105	0.000	12.890	0.006	0.258	0.000
Nitrogen	705	0.352	706	0.353	2596	1.298	2600	1.300
Oxygen	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Propane	58.025	0.029	1.180	0.001	531.898	0.266	11.234	0.006
Water	184.251	0.092	184.3	0.092	1246	0.623	1246	0.623
n-Butane	16.102	0.008	0.330	0.000	147.598	0.074	3.180	0.002
n-Heptane	0.000	0.000	0.004	0.000	0.000	0.000	0.113	0.000
n-Hexane	5.533	0.003	0.113	0.000	50.7	0.025	1.099	0.001
n-Pentane	3.818	0.002	0.079	0.000	35.0	0.017	0.779	0.000
Hydrogen Sulfide	0.118	0.000	0.002	0.000	0.108	0.000	0.002	0.000
2-Methylnaphthalene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3-Methylcholanthrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2-Dimethylbenz(a)anthrace	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acenaphthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acenaphthylene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benz(a)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzene	0.000	0.000	0.001	0.000	0.000	0.000	0.005	0.000
Benzo(a)pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(b)fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(g,h,i)perylene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(k)fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Chrysene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dibenzo(a,h)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dichlorobenzene	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000
Fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fluorene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Formaldehyde	0.000	0.000	0.020	0.000	0.000	0.000	0.182	0.000
Indeno(1,2,3-cd)pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
Toluene	0.000	0.000	0.001	0.000	0.000	0.000	0.008	0.000
Sulfur Dioxide	0.000	0.000	0.248	0.000	0.000	0.000	0.230	0.000
Total VOC	497.066	0.249	9.986	0.005	2,823	1.412	58.022	0.029
NOx	0.000	0.000	28.626	0.014	0.000	0.000	363.041	0.182
PM10	0.000	0.000	8.481	0.004	0.000	0.000	86.828	0.043
PM2.5	0.000	0.000	6.361	0.003	0.000	0.000	65.194	0.033
Ammonia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes

NOx is 0.068 lb/MMBtu and CO is 0.31 lb/MMBtu per AP-42 13.51 and 13.52, respectively. DRE of CO in the flare is 98%.
VOC are per AP42, Table 1.-4.3. VOC for natural gas components not listed in Table 1.4-3 are calculated using a DRE of 98%.
For purge gas, a balance across the flare is taken with a DRE of 98% is used for each component. Flare accounts for additional natural gas required to maintain 200 Btu/scf (EPA minimum) and associated VOC were considered are per AP42, Table 1.433

HTCR STACK EMISSIONS

Component	Max Hourly Emissions for Cold Startup				Total Emissions / Cold Startup			
	Pre-Treatment		Post-Treatment		Pre-Treatment		Post-Treatment	
	lb/hr	tons/hr	lb/hr	tons/hr	lbm	tons	lbm	tons
1-Butanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1-Pentanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1-Propanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2,2-Dimethylpropane	0.351	0.000	0.351	0.000	9.783	0.005	9.783	0.005
2-Butanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2-Methyl-1-Propanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2-Methylbutane	0.351	0.000	0.351	0.000	9.783	0.005	9.783	0.005
2-Propanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acetone	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Argon	3421.644	1.711	3421.644	1.711	85039.434	42.520	85039.434	42.520
Carbon Dioxide	14872.906	7.436	14889.711	7.445	402951.436	201.476	403408.028	201.704
Carbon Monoxide	12.583	0.006	1.887	0.001	341.884	0.171	51.283	0.026
Dimethyl Ether	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethane	0.375	0.000	0.375	0.000	10.457	0.005	10.457	0.005
Ethanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Formic Acid	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hydrogen	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
i-Butane	0.254	0.000	0.254	0.000	7.084	0.004	7.084	0.004
Methane	0.278	0.000	0.278	0.000	8.037	0.004	8.037	0.004
Methanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Methyl Ethyl Ketone	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Methyl Formate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nitrogen	198932.548	99.466	198932.548	99.466	4944395.033	2472.198	4944395.033	2472.198
Oxygen	45201.708	22.601	45197.066	22.599	945686.280	472.843	945520.290	472.760
Propane	0.194	0.000	0.194	0.000	5.591	0.003	5.591	0.003
Water	20334.204	10.167	20334.204	10.167	605056.943	302.528	605056.943	302.528
n-Butane	0.254	0.000	0.254	0.000	7.084	0.004	7.084	0.004
n-Heptane	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
n-Hexane	0.218	0.000	0.218	0.000	6.072	0.003	6.072	0.003
n-Pentane	0.351	0.000	0.351	0.000	9.783	0.005	9.783	0.005
Hydrogen Sulfide	0.001	0.000	0.001	0.000	0.015	0.000	0.015	0.000
2-Methylnaphthalene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3-Methylcholanthrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7,12-Dimethylbenz(a)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acenaphthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acenaphthylene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benz(a)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzene	0.000	0.000	0.000	0.000	0.007	0.000	0.007	0.000
Benzo(a)pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(b)fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(g,h,i)perylene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(k)fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Chrysene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dibenzo(a,h)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dichlorobenzene	0.000	0.000	0.000	0.000	0.004	0.000	0.004	0.000
Fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fluorene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Formaldehyde	0.009	0.000	0.009	0.000	0.253	0.000	0.253	0.000
Indeno(1,2,3-cd)pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Naphthalene	0.000	0.000	0.000	0.000	0.002	0.000	0.002	0.000
Toluene	0.000	0.000	0.000	0.000	0.011	0.000	0.011	0.000
Sulfur Dioxide	0.118	0.000	0.118	0.000	0.425	0.000	0.425	0.000
Total VOC	1.984	0.001	1.984	0.001	55.457	0.028	55.457	0.028
NOx	19.123	0.010	1.912	0.001	543.961	0.272	54.396	0.027
PM10	0.950	0.000	0.950	0.000	25.667	0.013	25.667	0.013
PM2.5	0.712	0.000	0.712	0.000	19.250	0.010	19.250	0.010
Ammonia	0.000	0.000	0.850	0.000	0.000	0.000	21.368	0.011

Notes

Natural Gas – Emissions were calculated by MPS per AP-42 Section 1.4. Emissions factors were based on guidance in Table 1.4-1, 1.4-2, and 1.4-3 with adjustments per OEM guidance. A DRE of 98% is used for any hydrocarbon not mentioned on Table 1.4-3.
The calculations assume a control efficiency associated with SCR-Oxycat as indicated in the Emission
Syngas – HT provided the calculations based on internal design and test experience.

FLARE EMISSIONS					
	Emissions for Cold Startup				
Component	Pre-Treatment		Post-Treatment		
	lb/hr	tons	lb/hr	tons	DRE
1-Butanol	0.000	0.000	0.000	0.000	
1-Pentanol	0.000	0.000	0.000	0.000	
1-Propanol	0.000	0.000	0.000	0.000	
2,2-Dimethylpropane	4.997	0.023	0.100	0.000	0.98
2-Butanol	0.001	0.000	0.000	0.000	
2-Methyl-1-Propanol	0.000	0.000	0.000	0.000	
2-Methylbutane	0.000	0.000	0.004	0.000	
2-Propanol	0.000	0.000	0.000	0.000	
Acetone	0.243	0.000	0.005	0.000	0.98
Argon	0.000	0.000	0.000	0.000	
Carbon Dioxide	15683	45.8	48418	289.6	
Carbon Monoxide	8584	17.838	290.1	1.184	0.97
Dimethyl Ether	3.077	0.004	0.062	0.000	0.98
Ethane	322.8	1.479	6.497	0.030	0.98
Ethanol	0.002	0.000	0.000	0.000	0.98
Formic Acid	0.000	0.000	0.000	0.000	
Hydrogen	3890	16.857	77.808	0.337	0.98
i-Butane	16.102	0.074	0.326	0.002	0.98
Methane	10377	77.452	207.9	1.556	0.98
Methanol	494	0.928	9.880	0.019	0.98
Methyl Ethyl Ketone	0.002	0.000	0.000	0.000	0.98
Methyl Formate	5.239	0.006	0.105	0.000	0.98
Nitrogen	705	1.298	706.057	1.300	
Oxygen	0.000	0.000	0.000	0.000	
Propane	58.0	0.266	1.180	0.006	0.98
Water	184.3	0.623	184.251	0.623	0.00
n-Butane	16.1	0.074	0.330	0.002	0.98
n-Heptane	0.000	0.000	0.004	0.000	
n-Hexane	5.533	0.025	0.113	0.001	0.98
n-Pentane	3.818	0.017	0.079	0.000	0.98
Hydrogen Sulfide	0.118	0.000	0.002	0.000	0.98
2-Methylnaphthalene	0.000	0.000	0.000	0.000	
3-Methylcholanthrene	0.000	0.000	0.000	0.000	
7,12-Dimethylbenz(a)anthracene	0.000	0.000	0.000	0.000	
Acenaphthene	0.000	0.000	0.000	0.000	
Acenaphthylene	0.000	0.000	0.000	0.000	
Anthracene	0.000	0.000	0.000	0.000	
Benz(a)anthracene	0.000	0.000	0.000	0.000	
Benzene	0.000	0.000	0.001	0.000	
Benzo(a)pyrene	0.000	0.000	0.000	0.000	
Benzo(b)fluoranthene	0.000	0.000	0.000	0.000	
Benzo(g,h,i)perylene	0.000	0.000	0.000	0.000	
Benzo(k)fluoranthene	0.000	0.000	0.000	0.000	
Chrysene	0.000	0.000	0.000	0.000	
Dibenzo(a,h)anthracene	0.000	0.000	0.000	0.000	
Dichlorobenzene	0.000	0.000	0.000	0.000	
Fluoranthene	0.000	0.000	0.000	0.000	
Fluorene	0.000	0.000	0.000	0.000	
Formaldehyde	0.000	0.000	0.020	0.000	
Indeno(1,2,3-cd)pyrene	0.000	0.000	0.000	0.000	
Naphthalene	0.000	0.000	0.000	0.000	
Phenanathrene	0.000	0.000	0.000	0.000	
Pyrene	0.000	0.000	0.000	0.000	
Toluene	0.000	0.000	0.001	0.000	
Sulfur Dioxide	0.000	0.000	0.248	0.000	
Total VOC	497.066	1.412	9.986	0.029	0.98
NOx	0.000	0.000	28.626	0.182	
PM10	0.000	0.000	8.481	0.043	
PM2.5	0.000	0.000	6.361	0.033	
Ammonia	0.000	0.000	0.000	0.000	
HAPS	499.6	0.954	10.0	0.019	

HTCR STACK EMISSIONS				
	Emissions for Cold Startup			
Component	Pre-Treatment		Post-Treatment	
	lb/hr	tons	lb/hr	tons
1-Butanol	0.000	0.000	0.000	0.000
1-Pentanol	0.000	0.000	0.000	0.000
1-Propanol	0.000	0.000	0.000	0.000
2,2-Dimethylpropane	0.351	0.005	0.351	0.005
2-Butanol	0.000	0.000	0.000	0.000
2-Methyl-1-Propanol	0.000	0.000	0.000	0.000
2-Methylbutane	0.351	0.005	0.351	0.005
2-Propanol	0.000	0.000	0.000	0.000
Acetone	0.000	0.000	0.000	0.000
Argon	3422	43	3422	43
Carbon Dioxide	14873	201.5	14890	201.7
Carbon Monoxide	12.583	0.171	1.887	0.026
Dimethyl Ether	0.000	0.000	0.000	0.000
Ethane	0.375	0.005	0.375	0.005
Ethanol	0.000	0.000	0.000	0.000
Formic Acid	0.000	0.000	0.000	0.000
Hydrogen	0.000	0.000	0.000	0.000
i-Butane	0.254	0.004	0.254	0.004
Methane	0.278	0.004	0.278	0.004
Methanol	0.000	0.000	0.000	0.000
Methyl Ethyl Ketone	0.000	0.000	0.000	0.000
Methyl Formate	0.000	0.000	0.000	0.000
Nitrogen	198933	2472	198933	2472
Oxygen	45202	473	45197	473
Propane	0.194	0.003	0.194	0.003
Water	20334	303	20334	303
n-Butane	0.254	0.004	0.254	0.004
n-Heptane	0.000	0.000	0.000	0.000
n-Hexane	0.218	0.003	0.218	0.003
n-Pentane	0.351	0.005	0.351	0.005
Hydrogen Sulfide	0.001	0.000	0.001	0.000
2-Methylnaphthalene	2.999E-06	0.000	2.999E-06	0.000
3-Methylcholanthrene	2.249E-07	0.000	2.249E-07	0.000
7,12-Dimethylbenz(a)anthracene	2.000E-06	0.000	2.000E-06	0.000
Acenaphthene	2.249E-07	0.000	2.249E-07	0.000
Acenaphthylene	2.249E-07	0.000	2.249E-07	0.000
Anthracene	2.999E-07	0.000	2.999E-07	0.000
Benz(a)anthracene	2.249E-07	0.000	2.249E-07	0.000
Benzene	2.624E-04	0.000	2.624E-04	0.000
Benzo(a)pyrene	1.500E-07	0.000	1.500E-07	0.000
Benzo(b)fluoranthene	2.249E-07	0.000	2.249E-07	0.000
Benzo(g,h,i)perylene	1.500E-07	0.000	1.500E-07	0.000
Benzo(k)fluoranthene	2.249E-07	0.000	2.249E-07	0.000
Chrysene	2.249E-07	0.000	2.249E-07	0.000
Dibenzo(a,h)anthracene	1.500E-07	0.000	1.500E-07	0.000
Dichlorobenzene	1.500E-04	0.000	1.500E-04	0.000
Fluoranthene	3.749E-07	0.000	3.749E-07	0.000
Fluorene	3.499E-07	0.000	3.499E-07	0.000
Formaldehyde	9.373E-03	0.000	9.373E-03	0.000
Indeno(1,2,3-cd)pyrene	2.249E-07	0.000	2.249E-07	0.000
Naphthalene	7.623E-05	0.000	7.623E-05	0.000
Phenanathrene	2.124E-06	0.000	2.124E-06	0.000
Pyrene	6.248E-07	0.000	6.248E-07	0.000
Toluene	4.249E-04	0.000	4.249E-04	0.000
Sulfur Dioxide	0.118	0.000	0.118	0.000
Total VOC	1.984	0.028	1.984	0.028
NOx	19.123	0.272	1.912	0.027
PM10	0.950	0.013	0.950	0.013
PM2.5	0.712	0.010	0.712	0.010
Ammonia	0.000	0.000	0.850	0.011
HAPS	0.229	0.003	0.229	0.003

FLARE EMISSIONS Per Unit Emissions from Cold Startup				
	Pre-Treatment		Post-Treatment	
	lb/hr	tons	lb/hr	tons
PM10	0.00	0.00	8.48	0.04
PM2.5	0.00	0.00	6.36	0.03
SO2	0.00	0.00	0.25	0.00
Nox	0.00	0.00	28.63	0.18
CO	8584	17.84	290.06	1.18
VOC	497	1.41	9.99	0.03
HAP	500	0.95	10.02	0.02

HTCR STACK EMISSIONS Per Unit Emissions from Cold Startup				
	Pre-Treatment		Post-Treatment	
	lb/hr	tons	lb/hr	tons
PM10	0.95	0.01	0.95	0.01
PM2.5	0.71	0.01	0.71	0.01
SO2	0.12	0.00	0.12	0.00
Nox	19.12	0.27	1.91	0.03
CO	12.58	0.17	1.89	0.03
VOC	1.98	0.03	1.98	0.03
HAP	0.23	0.00	0.23	0.00

ESTIMATED EMISSIONS DURING A SYNTHESIS LOOP TRIP EVENT

FLARE EMISSIONS

Component	Max Hourly Emissions for Syn. Loop Trip				Total Emissions / Syn. Loop Trip			
	Pre-Treatment		Post-Treatment		Pre-Treatment		Post-Treatment	
	lb/hr	tons/hr	lb/hr	tons/hr	lbm	tons	lbm	tons
1-Butanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1-Pentanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1-Propanol	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
2,2-Dimethylpropane	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000
2-Butanol	0.001	0.000	0.000	0.000	0.002	0.000	0.000	0.000
2-Methyl-1-Propanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2-Methylbutane	0.000	0.000	0.004	0.000	0.000	0.000	0.050	0.000
2-Propanol	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
Acetone	0.243	0.000	0.005	0.000	0.582	0.000	0.012	0.000
Argon	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Carbon Dioxide	21195	10.60	62641	31.3	97854	48.927	314991	157
Carbon Monoxide	17302	8.651	523	0.262	77849	38.925	2493	1.246
Dimethyl Ether	2.612	0.001	0.052	0.000	6.270	0.003	0.125	0.000
Ethane	0.000	0.000	0.041	0.000	0.000	0.000	0.547	0.000
Ethanol	0.002	0.000	0.000	0.000	0.006	0.000	0.000	0.000
Formic Acid	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hydrogen	7316.2	3.658	146.3	0.073	36931	18.465	738.6	0.369
i-Butane	0.000	0.000	0.004	0.000	0.000	0.000	0.057	0.000
Methane	5486	2.743	110.0	0.055	35588	17.794	715.9	0.358
Methanol	259.1	0.130	5.182	0.003	622	0.311	12.4	0.006
Methyl Ethyl Ketone	0.002	0.000	0.000	0.000	0.005	0.000	0.000	0.000
Methyl Formate	4.958	0.002	0.099	0.000	11.898	0.006	0.238	0.000
Nitrogen	138.2	0.069	138.3	0.069	895	0.447	896	0.448
Oxygen	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Propane	0.000	0.000	0.019	0.000	0.000	0.000	0.254	0.000
Water	352.8	0.176	352.8	0.176	1626	0.813	1626	0.813
n-Butane	0.000	0.000	0.007	0.000	0.000	0.000	0.099	0.000
n-Heptane	0.000	0.000	0.004	0.000	0.000	0.000	0.051	0.000
n-Hexane	0.000	0.000	0.003	0.000	0.000	0.000	0.037	0.000
n-Pentane	0.000	0.000	0.003	0.000	0.000	0.000	0.034	0.000
Hydrogen Sulfide	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2-Methylnaphthalene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3-Methylcholanthrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7,12-Dimethylbenz(a)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acenaphthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acenaphthylene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benz(a)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(a)pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(b)fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(g,h,i)perylene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(k)fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Chrysene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dibenzo(a,h)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dichlorobenzene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fluorene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Formaldehyde	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Indeno(1,2,3-cd)pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Phenanathrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Toluene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sulfur Dioxide	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
Total VOC	261.72	0.131	5.279	0.003	628.1	0.314	13.15	0.007
NOx	0.000	0.000	38.820	0.019	0.000	0.000	205.3	0.103
PM10	0.000	0.000	14.696	0.007	0.000	0.000	74.108	0.037
PM2.5	0.000	0.000	11.022	0.006	0.000	0.000	55.6	0.028
Ammonia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes

NOx is 0.068 lb/MMBtu and CO is 0.31 lb/MMBtu per AP-42 13.51 and 13.52, respectively. DRE of CO in the flare is 98%.
VOC are per AP42, Table 1.-4.3. VOC for natural gas components not listed in Table 1.4-3 are calculated using a DRE of 98%.
For purge gas, a balance across the flare is taken with a DRE of 98% is used for each component. Flare accounts for additional natural gas required to maintain 200 Btu/scf (EPA minimum) and associated VOC were considered are per AP42, Table 1.433

HTCR STACK EMISSIONS

Component	Max Hourly Emissions for Syn. Loop Trip				Total Emissions / Syn. Loop Trip			
	Pre-Treatment		Post-Treatment		Pre-Treatment		Post-Treatment	
	lb/hr	tons/hr	lb/hr	tons/hr	lbm	tons	lbm	tons
1-Butanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1-Pentanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1-Propanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2,2-Dimethylpropane	0.510	0.000	0.510	0.000	3.319	0.002	3.319	0.002
2-Butanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2-Methyl-1-Propanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2-Methylbutane	0.510	0.000	0.510	0.000	3.319	0.002	3.319	0.002
2-Propanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acetone	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Argon	3563	1.781	3563	1.781	19108	9.554	19108	9.554
Carbon Dioxide	21403	10.702	21427	10.714	136635	68.318	136790	68.395
Carbon Monoxide	18.054	0.009	2.708	0.001	115.534	0.058	17.330	0.009
Dimethyl Ether	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethane	0.545	0.000	0.545	0.000	3.547	0.002	3.547	0.002
Ethanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Formic Acid	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hydrogen	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
i-Butane	0.369	0.000	0.369	0.000	2.403	0.001	2.403	0.001
Methane	0.404	0.000	0.404	0.000	3.639	0.002	3.639	0.002
Methanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Methyl Ethyl Ketone	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Methyl Formate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nitrogen	207145	103.6	207145	103.6	1111093	555.5	1111093	555.5
Oxygen	33135	16.6	33126	16.6	146424	73.2	146368	73.2
Propane	0.281	0.000	0.281	0.000	2.531	0.001	2.531	0.001
Water	28967	14.483	28967	14.483	172991	86.495	172991	86.495
n-Butane	0.369	0.000	0.369	0.000	2.403	0.001	2.403	0.001
n-Heptane	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
n-Hexane	0.316	0.000	0.316	0.000	2.060	0.001	2.060	0.001
n-Pentane	0.510	0.000	0.510	0.000	3.319	0.002	3.319	0.002
Hydrogen Sulfide	0.002	0.000	0.002	0.000	0.004	0.000	0.004	0.000
2-Methylnaphthalene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3-Methylcholanthrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7,12-Dimethylbenz(a)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acenaphthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acenaphthylene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benz(a)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzene	0.000	0.000	0.000	0.000	0.002	0.000	0.002	0.000
Benzo(a)pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(b)fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(g,h,i)perylene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(k)fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Chrysene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dibenzo(a,h)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dichlorobenzene	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000
Fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fluorene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Formaldehyde	0.013	0.000	0.013	0.000	0.086	0.000	0.086	0.000
Indeno(1,2,3-cd)pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Naphthalene	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000
Phenanathrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Toluene	0.001	0.000	0.001	0.000	0.004	0.000	0.004	0.000
Sulfur Dioxide	0.169	0.000	0.169	0.000	0.261	0.000	0.261	0.000
Total VOC	2.880	0.001	2.880	0.001	19.448	0.010	19.448	0.010
NOx	18.326	0.009	1.833	0.001	127.928	0.064	12.793	0.006
PM10	1.366	0.001	1.366	0.001	8.727	0.004	8.727	0.004
PM2.5	1.024	0.001	1.024	0.001	6.545	0.003	6.545	0.003
Ammonia	0.000	0.000	0.904	0.000	0.000	0.000	4.890	0.002

Notes

Natural Gas – Emissions were calculated by MPS per AP-42 Section 1.4. Emissions factors were based on guidance in Table 1.4-1, 1.4-2 and 1.4-3 with adjustments per OEM guidance. A DRE of 98% is used for any hydrocarbon not mentioned on Table 1.4-3. The calculations assume a control efficiency associated with SCR-Oxycat as indicated in the Emission
Syngas – HT provided the calculations based on internal design and test experience.

FLARE EMISSIONS

Component	Emissions for SLT Event				
	Pre-Treatment		Post-Treatment		
	lb/hr	tons	lb/hr	tons	DRE
1-Butanol	0.000	0.000	0.000	0.000	
1-Pentanol	0.000	0.000	0.000	0.000	
1-Propanol	0.000	0.000	0.000	0.000	
2,2-Dimethylpropane	0.000	0.000	0.000	0.000	
2-Butanol	0.001	0.000	0.000	0.000	0.980
2-Methyl-1-Propanol	0.000	0.000	0.000	0.000	
2-Methylbutane	0.000	0.000	0.004	0.000	
2-Propanol	0.000	0.000	0.000	0.000	
Acetone	0.243	0.000	0.005	0.000	0.980
Argon	0.000	0.000	0.000	0.000	
Carbon Dioxide	21195	48.9	62641	157.5	
Carbon Monoxide	17302	38.9	523.0	1.246	0.970
Dimethyl Ether	2.612	0.003	0.052	0.000	0.980
Ethane	0.000	0.000	0.041	0.000	
Ethanol	0.002	0.000	0.000	0.000	0.980
Formic Acid	0.000	0.000	0.000	0.000	
Hydrogen	7316	18.465	146.325	0.369	0.980
i-Butane	0.000	0.000	0.004	0.000	
Methane	5486	17.794	110.0	0.358	0.980
Methanol	259.1	0.311	5.182	0.006	0.980
Methyl Ethyl Ketone	0.002	0.000	0.000	0.000	0.980
Methyl Formate	4.958	0.006	0.099	0.000	0.980
Nitrogen	138.2	0.447	138.3	0.448	
Oxygen	0.000	0.000	0.000	0.000	
Propane	0.000	0.000	0.019	0.000	
Water	352.8	0.813	352.8	0.813	0.000
n-Butane	0.000	0.000	0.007	0.000	
n-Heptane	0.000	0.000	0.004	0.000	
n-Hexane	0.000	0.000	0.003	0.000	
n-Pentane	0.000	0.000	0.003	0.000	
Hydrogen Sulfide	0.000	0.000	0.000	0.000	
2-Methylnaphthalene	0.000	0.000	0.000	0.000	
3-Methylcholanthrene	0.000	0.000	0.000	0.000	
7,12-Dimethylbenz(a)anthracene	0.000	0.000	0.000	0.000	
Acenaphthene	0.000	0.000	0.000	0.000	
Acenaphthylene	0.000	0.000	0.000	0.000	
Anthracene	0.000	0.000	0.000	0.000	
Benz(a)anthracene	0.000	0.000	0.000	0.000	
Benzene	0.000	0.000	0.000	0.000	
Benzo(a)pyrene	0.000	0.000	0.000	0.000	
Benzo(b)fluoranthene	0.000	0.000	0.000	0.000	
Benzo(g,h,i)perylene	0.000	0.000	0.000	0.000	
Benzo(k)fluoranthene	0.000	0.000	0.000	0.000	
Chrysene	0.000	0.000	0.000	0.000	
Dibenzo(a,h)anthracene	0.000	0.000	0.000	0.000	
Dichlorobenzene	0.000	0.000	0.000	0.000	
Fluoranthene	0.000	0.000	0.000	0.000	
Fluorene	0.000	0.000	0.000	0.000	
Formaldehyde	0.000	0.000	0.000	0.000	
Indeno(1,2,3-cd)pyrene	0.000	0.000	0.000	0.000	
Naphthalene	0.000	0.000	0.000	0.000	
Phenanathrene	0.000	0.000	0.000	0.000	
Pyrene	0.000	0.000	0.000	0.000	
Toluene	0.000	0.000	0.000	0.000	
Sulfur Dioxide	0.000	0.000	0.000	0.000	
Total VOC	261.7	0.314	5.279	0.007	0.980
NOx	0.000	0.000	38.820	0.103	
PM10	0.000	0.000	14.696	0.037	
PM2.5	0.000	0.000	11.022	0.028	
Ammonia	0.000	0.000	0.000	0.000	
HAPS	259.1	0.311	5.185	0.006	

HTCR STACK EMISSIONS

Component	Emissions for SLT Event			
	Pre-Treatment		Post-Treatment	
	lb/hr	tons	lb/hr	tons
1-Butanol	0.000	0.000	0.000	0.000
1-Pentanol	0.000	0.000	0.000	0.000
1-Propanol	0.000	0.000	0.000	0.000
2,2-Dimethylpropane	0.510	0.002	0.510	0.002
2-Butanol	0.000	0.000	0.000	0.000
2-Methyl-1-Propanol	0.000	0.000	0.000	0.000
2-Methylbutane	0.510	0.002	0.510	0.002
2-Propanol	0.000	0.000	0.000	0.000
Acetone	0.000	0.000	0.000	0.000
Argon	3562.6	9.554	3562.6	9.554
Carbon Dioxide	21403	68.318	21427	68.395
Carbon Monoxide	18.054	0.058	2.708	0.009
Dimethyl Ether	0.000	0.000	0.000	0.000
Ethane	0.545	0.002	0.545	0.002
Ethanol	0.000	0.000	0.000	0.000
Formic Acid	0.000	0.000	0.000	0.000
Hydrogen	0.000	0.000	0.000	0.000
i-Butane	0.369	0.001	0.369	0.001
Methane	0.404	0.002	0.404	0.002
Methanol	0.000	0.000	0.000	0.000
Methyl Ethyl Ketone	0.000	0.000	0.000	0.000
Methyl Formate	0.000	0.000	0.000	0.000
Nitrogen	207145	556	207145	556
Oxygen	33135	73	33126	73
Propane	0.281	0.001	0.281	0.001
Water	28967	86	28967	86
n-Butane	0.369	0.001	0.369	0.001
n-Heptane	0.000	0.000	0.000	0.000
n-Hexane	0.316	0.001	0.316	0.001
n-Pentane	0.510	0.002	0.510	0.002
Hydrogen Sulfide	0.002	0.000	0.002	0.000
2-Methylnaphthalene	0.000	0.000	0.000	0.000
3-Methylcholanthrene	0.000	0.000	0.000	0.000
7,12-Dimethylbenz(a)anthracene	0.000	0.000	0.000	0.000
Acenaphthene	0.000	0.000	0.000	0.000
Acenaphthylene	0.000	0.000	0.000	0.000
Anthracene	0.000	0.000	0.000	0.000
Benz(a)anthracene	0.000	0.000	0.000	0.000
Benzene	0.000	0.000	0.000	0.000
Benzo(a)pyrene	0.000	0.000	0.000	0.000
Benzo(b)fluoranthene	0.000	0.000	0.000	0.000
Benzo(g,h,i)perylene	0.000	0.000	0.000	0.000
Benzo(k)fluoranthene	0.000	0.000	0.000	0.000
Chrysene	0.000	0.000	0.000	0.000
Dibenzo(a,h)anthracene	0.000	0.000	0.000	0.000
Dichlorobenzene	0.000	0.000	0.000	0.000
Fluoranthene	0.000	0.000	0.000	0.000
Fluorene	0.000	0.000	0.000	0.000
Formaldehyde	0.013	0.000	0.013	0.000
Indeno(1,2,3-cd)pyrene	0.000	0.000	0.000	0.000
Naphthalene	0.000	0.000	0.000	0.000
Phenanathrene	0.000	0.000	0.000	0.000
Pyrene	0.000	0.000	0.000	0.000
Toluene	0.001	0.000	0.001	0.000
Sulfur Dioxide	0.169	0.000	0.169	0.000
Total VOC	2.880	0.010	2.880	0.010
NOx	18.33	0.064	1.833	0.006
PM10	1.366	0.004	1.366	0.004
PM2.5	1.024	0.003	1.024	0.003
Ammonia	0.000	0.000	0.904	0.002
HAPS	0.333	0.001	0.333	0.001

FLARE EMISSIONS Per Unit Emissions from Syn Loop Trip				
	Pre-Treatment		Post-Treatment	
	lb/hr	tons	lb/hr	tons
PM10	0.00	0.00	14.70	0.04
PM2.5	0.00	0.00	11.02	0.03
SO2	0.00	0.00	0.00	0.00
Nox	0.00	0.00	38.82	0.10
CO	17,302	38.92	523	1.25
VOC	261.72	0.31	5.28	0.01
HAP	259.10	0.31	5.18	0.01

HTCR STACK EMISSIONS Per Unit Emissions from Syn Loop Trip				
	Pre-Treatment		Post-Treatment	
	lb/hr	tons	lb/hr	tons
PM10	1.37	0.00	1.37	0.00
PM2.5	1.02	0.00	1.02	0.00
SO2	0.17	0.00	0.17	0.00
Nox	18.33	0.06	1.83	0.01
CO	18	0.06	3	0.01
VOC	2.88	0.01	2.88	0.01
HAP	0.33	0.00	0.33	0.00

ESTIMATED EMISSIONS DURING A REFORMER TRIP AND HOT RESTART

FLARE EMISSIONS

Component	Max Hourly Emissions for HTCR Trip & Restart				Total Emissions / HTCR Trip & Restart			
	Pre-Treatment		Post-Treatment		Pre-Treatment		Post-Treatment	
	lb/hr	tons/hr	lb/hr	tons/hr	lbm	tons	lbm	tons
1-Butanol	0.012	0.000	0.000	0.000	0.002	0.000	0.000	0.000
1-Pentanol	0.008	0.000	0.000	0.000	0.001	0.000	0.000	0.000
1-Propanol	0.024	0.000	0.000	0.000	0.006	0.000	0.000	0.000
2,2-Dimethylpropane	4.997	0.002	0.100	0.000	27.505	0.014	0.553	0.000
2-Butanol	0.020	0.000	0.000	0.000	0.005	0.000	0.000	0.000
2-Methyl-1-Propanol	0.007	0.000	0.000	0.000	0.001	0.000	0.000	0.000
2-Methylbutane	2.022	0.001	0.044	0.000	0.394	0.000	0.078	0.000
2-Propanol	0.013	0.000	0.000	0.000	0.003	0.000	0.000	0.000
Acetone	0.243	0.000	0.005	0.000	0.582	0.000	0.012	0.000
Argon	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Carbon Dioxide	15351	7.676	48993	24.50	81570	40.785	407045	203.5
Carbon Monoxide	8584	4.292	292.3	0.146	33382	16.691	1796	0.898
Dimethyl Ether	2.612	0.001	0.052	0.000	6.285	0.003	0.126	0.000
Ethane	322.8	0.161	6.497	0.003	1780	0.890	36.369	0.018
Ethanol	0.080	0.000	0.002	0.000	0.021	0.000	0.000	0.000
Formic Acid	0.005	0.000	0.000	0.000	0.001	0.000	0.000	0.000
Hydrogen	3654	1.827	73.1	0.037	25434	12.717	508.7	0.254
i-Butane	16.102	0.008	0.326	0.000	89.005	0.045	1.861	0.001
Methane	10377	5.189	207.9	0.104	98691	49.345	1980	0.990
Methanol	259	0.130	5.182	0.003	655	0.327	13.099	0.007
Methyl Ethyl Ketone	0.002	0.000	0.000	0.000	0.005	0.000	0.000	0.000
Methyl Formate	4.958	0.002	0.099	0.000	11.908	0.006	0.238	0.000
Nitrogen	138	0.069	138	0.069	1104	0.552	1105.3	0.553
Oxygen	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Propane	58.0	0.029	1.180	0.001	321	0.161	6.783	0.003
Water	238.8	0.119	238.8	0.119	1248	0.624	1248.2	0.624
n-Butane	16.1	0.008	0.330	0.000	89.384	0.045	1.927	0.001
n-Heptane	2.239	0.001	0.049	0.000	0.436	0.000	0.080	0.000
n-Hexane	5.533	0.003	0.113	0.000	30.71	0.015	0.666	0.000
n-Pentane	3.818	0.002	0.079	0.000	21.31	0.011	0.475	0.000
Hydrogen Sulfide	0.118	0.000	0.002	0.000	0.065	0.000	0.001	0.000
2-Methylnaphthalene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3-Methylcholanthrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7,12-Dimethylbenz(a)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acenaphthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acenaphthylene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benz(a)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzene	0.000	0.000	0.001	0.000	0.000	0.000	0.003	0.000
Benzo(a)pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(b)fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(g,h,i)perylene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(k)fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Chrysene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dibenzo(a,h)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dichlorobenzene	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000
Fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fluorene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Formaldehyde	0.000	0.000	0.020	0.000	0.000	0.000	0.109	0.000
Indeno(1,2,3-cd)pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
Phenanathrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Toluene	0.000	0.000	0.001	0.000	0.000	0.000	0.005	0.000
Sulfur Dioxide	0.000	0.000	0.248	0.000	0.000	0.000	0.137	0.000
Total VOC	261.72	0.131	5.279	0.003	1241	0.621	25.767	0.013
NOx	0.000	0.000	26.461	0.013	0.000	0.000	247.576	0.124
PM10	0.000	0.000	8.520	0.004	0.000	0.000	63.544	0.032
PM2.5	0.000	0.000	6.390	0.003	0.000	0.000	47.658	0.024
Ammonia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes

NOx is 0.068 lb/MMBtu and CO is 0.31 lb/MMBtu per AP-42 13.51 and 13.52, respectively. DRE of CO in the flare is 98%.
VOC are per AP42, Table 1.-4.3. VOC for natural gas components not listed in Table 1.4-3 are calculated using a DRE of 98%.
For purge gas, a balance across the flare is taken with a DRE of 98% is used for each component. Flare accounts for additional natural gas required to maintain 200 Btu/scf (EPA minimum) and associated VOC were considered are per AP42, Table 1.433

HTCR STACK EMISSIONS

Component	Max Hourly Emissions for HTCR Trip & Restart				Total Emissions / HTCR Trip & Restart			
	Pre-Treatment		Post-Treatment		Pre-Treatment		Post-Treatment	
	lb/hr	tons/hr	lb/hr	tons/hr	lbm	tons	lbm	tons
1-Butanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1-Pentanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1-Propanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2,2-Dimethylpropane	0.351	0.000	0.351	0.000	5.606	0.003	5.606	0.003
2-Butanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2-Methyl-1-Propanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2-Methylbutane	0.351	0.000	0.351	0.000	5.606	0.003	5.606	0.003
2-Propanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acetone	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Argon	3422	1.7	3422	1.7	44043	22.0	44043	22.0
Carbon Dioxide	14873	7.436	14890	7.445	230948	115.5	231209	115.6
Carbon Monoxide	12.583	0.006	1.887	0.001	195.778	0.098	29.367	0.015
Dimethyl Ether	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethane	0.375	0.000	0.375	0.000	5.993	0.003	5.993	0.003
Ethanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Formic Acid	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hydrogen	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
i-Butane	0.254	0.000	0.254	0.000	4.060	0.002	4.060	0.002
Methane	0.278	0.000	0.278	0.000	4.635	0.002	4.635	0.002
Methanol	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Methyl Ethyl Ketone	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Methyl Formate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Nitrogen	198933	99	198933	99	2560795	1280	2560795	1280
Oxygen	45202	23	45197	23	457878	229	457783	229
Propane	0.194	0.000	0.194	0.000	3.224	0.002	3.224	0.002
Water	20334	10.167	20334	10.167	331253	166	331253	166
n-Butane	0.254	0.000	0.254	0.000	4.060	0.002	4.060	0.002
n-Heptane	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
n-Hexane	0.218	0.000	0.218	0.000	3.480	0.002	3.480	0.002
n-Pentane	0.351	0.000	0.351	0.000	5.606	0.003	5.606	0.003
Hydrogen Sulfide	0.001	0.000	0.001	0.000	0.009	0.000	0.009	0.000
2-Methylnaphthalene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3-Methylcholanthrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7,12-Dimethylbenz(a)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acenaphthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Acenaphthylene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benz(a)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzene	0.000	0.000	0.000	0.000	0.004	0.000	0.004	0.000
Benzo(a)pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(b)fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(g,h,i)perylene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Benzo(k)fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Chrysene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dibenzo(a,h)anthracene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dichlorobenzene	0.000	0.000	0.000	0.000	0.002	0.000	0.002	0.000
Fluoranthene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fluorene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Formaldehyde	0.009	0.000	0.009	0.000	0.145	0.000	0.145	0.000
Indeno(1,2,3-cd)pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Naphthalene	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000
Phenanathrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pyrene	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Toluene	0.000	0.000	0.000	0.000	0.007	0.000	0.007	0.000
Sulfur Dioxide	0.118	0.000	0.118	0.000	0.289	0.000	0.289	0.000
Total VOC	1.984	0.001	1.984	0.001	31.802	0.016	31.802	0.016
NOx	19.123	0.010	1.912	0.001	274.190	0.137	27.419	0.014
PM10	0.950	0.000	0.950	0.000	14.722	0.007	14.722	0.007
PM2.5	0.712	0.000	0.712	0.000	11.041	0.006	11.041	0.006
Ammonia	0.000	0.000	0.850	0.000	0.000	0.000	11.109	0.006

Notes

Natural Gas – Emissions were calculated by MPS per AP-42 Section 1.4. Emissions factors were based on guidance in Table 1.4-1, 1.4-2, and 1.4-3 with adjustments per OEM guidance. A DRE of 98% is used for any hydrocarbon not mentioned on Table 1.4-3.
The calculations assume a control efficiency associated with SCR-Oxycat as indicated in the Emission
Syngas – HT provided the calculations based on internal design and test experience.

FLARE EMISSIONS					
Component	Emissions for Reformer Trip and Restart				
	Pre-Treatment		Post-Treatment		
	lb/hr	tons	lb/hr	tons	DRE
1-Butanol	0.012	0.000	0.000	0.000	0.98
1-Pentanol	0.008	0.000	0.000	0.000	0.98
1-Propanol	0.024	0.000	0.000	0.000	0.98
2,2-Dimethylpropane	4.997	0.014	0.100	0.000	0.98
2-Butanol	0.020	0.000	0.000	0.000	0.98
2-Methyl-1-Propanol	0.007	0.000	0.000	0.000	0.98
2-Methylbutane	2.022	0.000	0.044	0.000	0.98
2-Propanol	0.013	0.000	0.000	0.000	0.98
Acetone	0.243	0.000	0.005	0.000	0.98
Argon	0.000	0.000	0.000	0.000	
Carbon Dioxide	15351	40.8	48993	203.5	
Carbon Monoxide	8584	16.691	292	0.898	0.98
Dimethyl Ether	2.612	0.003	0.052	0.000	0.98
Ethane	322.789	0.890	6.497	0.018	0.98
Ethanol	0.080	0.000	0.002	0.000	0.98
Formic Acid	0.005	0.000	0.000	0.000	0.98
Hydrogen	3654.3	12.717	73.087	0.254	0.98
i-Butane	16.102	0.045	0.326	0.001	0.98
Methane	10377.3	49.345	207.859	0.990	0.98
Methanol	259.098	0.327	5.182	0.007	0.98
Methyl Ethyl Ketone	0.002	0.000	0.000	0.000	0.98
Methyl Formate	4.958	0.006	0.099	0.000	0.98
Nitrogen	138.247	0.552	138.337	0.553	
Oxygen	0.000	0.000	0.000	0.000	
Propane	58.025	0.161	1.180	0.003	0.98
Water	238.8	0.624	238.8	0.624	
n-Butane	16.102	0.045	0.330	0.001	0.98
n-Heptane	2.239	0.000	0.049	0.000	0.98
n-Hexane	5.533	0.015	0.113	0.000	0.98
n-Pentane	3.818	0.011	0.079	0.000	0.98
Hydrogen Sulfide	0.118	0.000	0.002	0.000	0.98
2-Methylnaphthalene	0.000	0.000	0.000	0.000	
3-Methylcholanthrene	0.000	0.000	0.000	0.000	
7,12-Dimethylbenz(a)anthracene	0.000	0.000	0.000	0.000	
Acenaphthene	0.000	0.000	0.000	0.000	
Acenaphthylene	0.000	0.000	0.000	0.000	
Anthracene	0.000	0.000	0.000	0.000	
Benz(a)anthracene	0.000	0.000	0.000	0.000	
Benzene	0.000	0.000	0.001	0.000	
Benzo(a)pyrene	0.000	0.000	0.000	0.000	
Benzo(b)fluoranthene	0.000	0.000	0.000	0.000	
Benzo(g,h,i)perylene	0.000	0.000	0.000	0.000	
Benzo(k)fluoranthene	0.000	0.000	0.000	0.000	
Chrysene	0.000	0.000	0.000	0.000	
Dibenzo(a,h)anthracene	0.000	0.000	0.000	0.000	
Dichlorobenzene	0.000	0.000	0.000	0.000	
Fluoranthene	0.000	0.000	0.000	0.000	
Fluorene	0.000	0.000	0.000	0.000	
Formaldehyde	0.000	0.000	0.020	0.000	
Indeno(1,2,3-cd)pyrene	0.000	0.000	0.000	0.000	
Naphthalene	0.000	0.000	0.000	0.000	
Phenanathrene	0.000	0.000	0.000	0.000	
Pyrene	0.000	0.000	0.000	0.000	
Toluene	0.000	0.000	0.001	0.000	
Sulfur Dioxide	0.000	0.000	0.248	0.000	
Total VOC	261.7	0.621	5.279	0.013	0.980
NOx	0.000	0.000	26.461	0.124	
PM10	0.000	0.000	8.520	0.032	
PM2.5	0.000	0.000	6.390	0.024	
Ammonia	0.000	0.000	0.000	0.000	
HAPS	264.751	0.343	5.319	0.007	

HTCR STACK EMISSIONS				
Component	Emissions for Reformer Trip and Restart			
	Pre-Treatment		Post-Treatment	
	lb/hr	tons	lb/hr	tons
1-Butanol	0.000	0.000	0.000	0.000
1-Pentanol	0.000	0.000	0.000	0.000
1-Propanol	0.000	0.000	0.000	0.000
2,2-Dimethylpropane	0.351	0.003	0.351	0.003
2-Butanol	0.000	0.000	0.000	0.000
2-Methyl-1-Propanol	0.000	0.000	0.000	0.000
2-Methylbutane	0.351	0.003	0.351	0.003
2-Propanol	0.000	0.000	0.000	0.000
Acetone	0.000	0.000	0.000	0.000
Argon	3421.644	22.021	3421.644	22.021
Carbon Dioxide	14872.906	115.474	14889.711	115.605
Carbon Monoxide	12.583	0.098	1.887	0.015
Dimethyl Ether	0.000	0.000	0.000	0.000
Ethane	0.375	0.003	0.375	0.003
Ethanol	0.000	0.000	0.000	0.000
Formic Acid	0.000	0.000	0.000	0.000
Hydrogen	0.000	0.000	0.000	0.000
i-Butane	0.254	0.002	0.254	0.002
Methane	0.278	0.002	0.278	0.002
Methanol	0.000	0.000	0.000	0.000
Methyl Ethyl Ketone	0.000	0.000	0.000	0.000
Methyl Formate	0.000	0.000	0.000	0.000
Nitrogen	198932.548	1280.398	198932.548	1280.398
Oxygen	45201.708	228.939	45197.066	228.892
Propane	0.194	0.002	0.194	0.002
Water	20334.204	165.627	20334.204	165.627
n-Butane	0.254	0.002	0.254	0.002
n-Heptane	0.000	0.000	0.000	0.000
n-Hexane	0.218	0.002	0.218	0.002
n-Pentane	0.351	0.003	0.351	0.003
Hydrogen Sulfide	0.001	0.000	0.001	0.000
2-Methylnaphthalene	0.000	0.000	0.000	0.000
3-Methylcholanthrene	0.000	0.000	0.000	0.000
7,12-Dimethylbenz(a)anthracene	0.000	0.000	0.000	0.000
Acenaphthene	0.000	0.000	0.000	0.000
Acenaphthylene	0.000	0.000	0.000	0.000
Anthracene	0.000	0.000	0.000	0.000
Benz(a)anthracene	0.000	0.000	0.000	0.000
Benzene	0.000	0.000	0.000	0.000
Benzo(a)pyrene	0.000	0.000	0.000	0.000
Benzo(b)fluoranthene	0.000	0.000	0.000	0.000
Benzo(g,h,i)perylene	0.000	0.000	0.000	0.000
Benzo(k)fluoranthene	0.000	0.000	0.000	0.000
Chrysene	0.000	0.000	0.000	0.000
Dibenzo(a,h)anthracene	0.000	0.000	0.000	0.000
Dichlorobenzene	0.000	0.000	0.000	0.000
Fluoranthene	0.000	0.000	0.000	0.000
Fluorene	0.000	0.000	0.000	0.000
Formaldehyde	0.009	0.000	0.009	0.000
Indeno(1,2,3-cd)pyrene	0.000	0.000	0.000	0.000
Naphthalene	0.000	0.000	0.000	0.000
Phenanathrene	0.000	0.000	0.000	0.000
Pyrene	0.000	0.000	0.000	0.000
Toluene	0.000	0.000	0.000	0.000
Sulfur Dioxide	0.118	0.000	0.118	0.000
Total VOC	1.984	0.016	1.984	0.016
NOx	19.123	0.137	1.912	0.014
PM10	0.950	0.007	0.950	0.007
PM2.5	0.712	0.006	0.712	0.006
Ammonia	0.000	0.000	0.850	0.006
HAPS	0.229	0.002	0.229	0.002

FLARE EMISSIONS Per Unit Emissions from Reformer Trip and Restart				
	lb/hr	tons	lb/hr	tons
PM10	0.00	0.00	8.52	0.03
PM2.5	0.00	0.00	6.39	0.02
SO2	0.00	0.00	0.25	0.00
Nox	0.00	0.00	26.46	0.12
CO	8,584	16.69	292	0.90
VOC	261.72	0.62	5.28	0.01
HAP	264.75	0.34	5.32	0.01

HTCR STACK EMISSIONS Per Unit Emissions from Reformer Trip and Restart				
	lb/hr	tons	lb/hr	tons
PM10	0.95	0.01	0.95	0.01
PM2.5	0.71	0.01	0.71	0.01
SO2	0.12	0.00	0.12	0.00
Nox	19.12	0.14	1.91	0.01
CO	13	0.10	2	0.01
VOC	1.98	0.02	1.98	0.02
HAP	0.23	0.00	0.23	0.00

ESTIMATED EMISSIONS DURING A COMPLETE PLANT SHUTDOWN AND CLEARING EVENT

FLARE EMISSIONS								
Component	Max Hourly Emissions for Unit Shutdown				Total Emissions / Unit Shutdown			
	Pre-Treatment		Post-Treatment		Pre-Treatment		Post-Treatment	
	lb/hr	tons/hr	lb/hr	tons/hr	lbm	tons	lbm	tons
1-Butanol	0.012	0.000	0.000	0.000	0.002	0.000	0.000	0.000
1-Pentanol	0.008	0.000	0.000	0.000	0.001	0.000	0.000	0.000
1-Propanol	0.024	0.000	0.000	0.000	0.005	0.000	0.000	0.000
2,2-Dimethylpropane	0.116	0.000	0.015	0.000	0.023	0.000	0.011	0.000
2-Butanol	0.020	0.000	0.000	0.000	0.004	0.000	0.000	0.000
2-Methyl-1-Propanol	0.007	0.000	0.000	0.000	0.001	0.000	0.000	0.000
2-Methylbutane	2.022	0.001	0.044	0.000	0.394	0.000	0.134	0.000
2-Propanol	0.013	0.000	0.000	0.000	0.002	0.000	0.000	0.000
Acetone	-	-	-	-	-	-	-	-
Argon	-	-	-	-	-	-	-	-
Carbon Dioxide	1,245	0.623	5,810	2.905	558	0.279	8,433	4.217
Carbon Monoxide	838.5	0.419	32.134	0.016	245.9	0.123	45.12	0.023
Dimethyl Ether	0.050	0.000	0.001	0.000	0.106	0.000	0.002	0.000
Ethane	23.551	0.012	1.057	0.001	4.590	0.002	1.832	0.001
Ethanol	0.080	0.000	0.002	0.000	0.016	0.000	0.000	0.000
Formic Acid	0.005	0.000	0.000	0.000	0.001	0.000	0.000	0.000
Hydrogen	386.2	0.193	7.724	0.004	567.6	0.284	11.35	0.006
i-Butane	2.286	0.001	0.053	0.000	0.445	0.000	0.170	0.000
Methane	1,142.9	0.571	32.725	0.016	1,464.8	0.732	51.169	0.026
Methanol	27.866	0.014	0.557	0.000	59.200	0.030	1.184	0.001
Methyl Ethyl Ketone	-	-	-	-	-	-	-	-
Methyl Formate	0.027	0.000	0.001	0.000	0.059	0.000	0.001	0.000
Nitrogen	5,328	2.664	5,337	2.669	2,231	1.115	2,237	1.118
Oxygen	-	-	-	-	-	-	-	-
Propane	10.861	0.005	0.236	0.000	2.117	0.001	0.749	0.000
Water	277.0	0.138	277.0	0.138	157.5	0.079	157.5	0.079
n-Butane	4.230	0.002	0.092	0.000	0.824	0.000	0.283	0.000
n-Heptane	2.239	0.001	0.049	0.000	0.436	0.000	0.136	0.000
n-Hexane	1.452	0.001	0.032	0.000	0.283	0.000	0.104	0.000
n-Pentane	1.608	0.001	0.035	0.000	0.313	0.000	0.098	0.000
Hydrogen Sulfide	-	-	0.000	0.000	-	-	0.000	0.000
2-Methylnaphthalene	-	-	0.000	0.000	-	-	0.000	0.000
3-Methylcholanthrene	-	-	0.000	0.000	-	-	0.000	0.000
7,12-Dimethylbenz(a)anthracene	-	-	0.000	0.000	-	-	0.000	0.000
Acenaphthene	-	-	0.000	0.000	-	-	0.000	0.000
Acenaphthylene	-	-	0.000	0.000	-	-	0.000	0.000
Anthracene	-	-	0.000	0.000	-	-	0.000	0.000
Benz(a)anthracene	-	-	0.000	0.000	-	-	0.000	0.000
Benzene	-	-	0.000	0.000	-	-	0.000	0.000
Benzo(a)pyrene	-	-	0.000	0.000	-	-	0.000	0.000
Benzo(b)fluoranthene	-	-	0.000	0.000	-	-	0.000	0.000
Benzo(g,h,i)perylene	-	-	0.000	0.000	-	-	0.000	0.000
Benzo(k)fluoranthene	-	-	0.000	0.000	-	-	0.000	0.000
Chrysene	-	-	0.000	0.000	-	-	0.000	0.000
Dibenzo(a,h)anthracene	-	-	0.000	0.000	-	-	0.000	0.000
Dichlorobenzene	-	-	0.000	0.000	-	-	0.000	0.000
Fluoranthene	-	-	0.000	0.000	-	-	0.000	0.000
Fluorene	-	-	0.000	0.000	-	-	0.000	0.000
Formaldehyde	-	-	0.003	0.000	-	-	0.005	0.000
Indeno(1,2,3-cd)pyrene	-	-	0.000	0.000	-	-	0.000	0.000
Naphthalene	-	-	0.000	0.000	-	-	0.000	0.000
Phenanathrene	-	-	0.000	0.000	-	-	0.000	0.000
Pyrene	-	-	0.000	0.000	-	-	0.000	0.000
Toluene	-	-	0.000	0.000	-	-	0.000	0.000
Sulfur Dioxide	-	-	0.111	0.000	-	-	0.004	0.000
Total VOC	28.396	0.014	0.612	0.000	64.175	0.032	2.876	0.001
NOx	-	-	3.370	0.002	-	-	5.876	0.003
PM10	-	-	0.972	0.000	-	-	1.330	0.001
PM2.5	-	-	0.729	0.000	-	-	1.428	0.001
Ammonia	-	-	-	-	-	-	-	-

Notes

NOx is 0.068 lb/MMBtu and CO is 0.31 lb/MMBtu per AP-42 13.51 and 13.52, respectively. DRE of CO in the flare is 98%.

VOC are per AP42, Table 1.-4.3. VOC for natural gas components not listed in Table 1.4-3 are calculated using a DRE of 98%.

Notes continued
For purge gas, a balance across the flare is taken with a DRE of 98% is used for each component. Flare accounts for additional natural gas required to maintain 200 Btu/scf (EPA minimum) and associated VOC were considered are per AP42, Table 1.433

FLARE EMISSIONS					
Component	Emissions for Unit Shutdown				
	Pre-Treatment		Post-Treatment		
	lb/hr	tons	lb/hr	tons	DRE
1-Butanol	0.012	0.000	0.000	0.000	
1-Pentanol	0.008	0.000	0.000	0.000	
1-Propanol	0.024	0.000	0.000	0.000	
2,2-Dimethylpropane	0.116	0.000	0.015	0.000	0.87
2-Butanol	0.020	0.000	0.000	0.000	0.98
2-Methyl-1-Propanol	0.007	0.000	0.000	0.000	0.98
2-Methylbutane	2.022	0.000	0.044	0.000	0.98
2-Propanol	0.013	0.000	0.000	0.000	0.98
Acetone	-	-	-	-	
Argon	-	-	-	-	
Carbon Dioxide	1,245.1	0.279	5,810	4.217	
Carbon Monoxide	838.5	0.123	32.13	0.023	0.96
Dimethyl Ether	0.050	0.000	0.001	0.000	0.98
Ethane	23.551	0.002	1.057	0.001	0.96
Ethanol	0.080	0.000	0.002	0.000	0.98
Formic Acid	0.005	0.000	0.000	0.000	
Hydrogen	386.200	0.284	7.724	0.006	0.98
i-Butane	2.286	0.000	0.053	0.000	0.98
Methane	1,143	0.732	32.72	0.026	0.97
Methanol	27.866	0.030	0.557	0.001	0.98
Methyl Ethyl Ketone	-	-	-	-	
Methyl Formate	0.027	0.000	0.001	0.000	0.98
Nitrogen	5,328	1.12	5,337	1.12	
Oxygen	-	-	-	-	
Propane	10.861	0.001	0.236	0.000	0.98
Water	277.0	0.079	277.0	0.079	0.00
n-Butane	4.230	0.000	0.092	0.000	0.98
n-Heptane	2.239	0.000	0.049	0.000	
n-Hexane	1.452	0.000	0.032	0.000	0.98
n-Pentane	1.608	0.000	0.035	0.000	0.98
Hydrogen Sulfide	-	-	0.000	0.000	
2-Methylnaphthalene	-	-	0.000	0.000	
3-Methylcholanthrene	-	-	0.000	0.000	
7,12-Dimethylbenz(a)anthracene	-	-	0.000	0.000	
Acenaphthene	-	-	0.000	0.000	
Acenaphthylene	-	-	0.000	0.000	
Anthracene	-	-	0.000	0.000	
Benz(a)anthracene	-	-	0.000	0.000	
Benzene	-	-	0.000	0.000	
Benzo(a)pyrene	-	-	0.000	0.000	
Benzo(b)fluoranthene	-	-	0.000	0.000	
Benzo(g,h,i)perylene	-	-	0.000	0.000	
Benzo(k)fluoranthene	-	-	0.000	0.000	
Chrysene	-	-	0.000	0.000	
Dibenzo(a,h)anthracene	-	-	0.000	0.000	
Dichlorobenzene	-	-	0.000	0.000	
Fluoranthene	-	-	0.000	0.000	
Fluorene	-	-	0.000	0.000	
Formaldehyde	-	-	0.003	0.000	
Indeno(1,2,3-cd)pyrene	-	-	0.000	0.000	
Naphthalene	-	-	0.000	0.000	
Phenanathrene	-	-	0.000	0.000	
Pyrene	-	-	0.000	0.000	
Toluene	-	-	0.000	0.000	
Sulfur Dioxide	-	-	0.111	0.000	
Total VOC	28.396	0.032	0.612	0.001	0.98
NOx	-	-	3.370	0.003	
PM10	-	-	0.972	0.001	
PM2.5	-	-	0.729	0.001	
Ammonia	-	-	-	-	
HAPS	29.318	0.030	0.593	0.001	

FLARE EMISSIONS Per Unit Emissions from Shutdown				
	lb/hr	tons	lb/hr	tons
PM10	0.00	0.00	0.97	0.00
PM2.5	0.00	0.00	0.73	0.00
SO2	0.00	0.00	0.11	0.00
Nox	0.00	0.00	3.37	0.00
CO	838	0.12	32	0.02
VOC	28.40	0.03	0.61	0.00
HAP	29.32	0.03	0.59	0.00

FLARE LP SECTION EMISSIONS

OPERATING PARAMETERS

Normal Operations

Operating Schedule	8760	hrs/yr	
Natural Gas HHV	1,084	Btu/scf	
Number of burners	6		Pilot Burners serve both HP and LP sections of flare
Btu/h per burner	45,000		but are included under LP section for calculation
Pilot Natural Gas Heat Duty	0.27	MMBtu/h	purposes.
LP Gas to Flare	0.004	MMBtu/h	Normal fugitive
LP Gas to Flare Intermittent	0.020	MMBtu/h	Intermittent allocation between leak repairs
Total LP Gas Duty	0.294	MMBtu/h	
Annual Heat Input to LP Flare	2574.5	MMBtu/yr	

EMISSION CALCULATIONS

Combustion Emissions

		HHV		
Emission Factor	**lb/scf**	**lb/MMBtu**	**mg/l**	
SO2	0.6018	0.00059		Ref 1, Table 1.4-2
NOx		0.068		Ref 2, Table 13.5-1, note C
CO		0.279279279		Ref 2, Table 13.5-2
THC		0.14		Ref 2, Table 13.5-3
PM		0.0024	40	Ref 2, Table 13.5-1 lightly smoking
VOC (comb)	5.5	0.0054		Ref 1, Table 1.4-2
	GWP			
CH4	25	0.0022		40 CFT 98 Table C-2
N2O	298	0.00022		40 CFT 98 Table C-2

[1]**Emission factors in EPA AP-42, Section 1.5, "Natural Gas Combustor", July 1998**

[2]**Emission factors in EPA AP-42, Section 13.5, "Industrial Flares", February 2018, as corrected to HHV basis**

Emissions From LP Flare			**Per Plant**
	lb/h	**tpy**	**tpy**
PM	0.00	0.003	0.01
PM10	0.00	0.003	0.009
PM2.5	0.00	0.003	0.01
SO2	0.00	0.001	0.002
NOx	0.02	0.088	0.263
CO	0.08	0.360	1.079
VOC	0.00	0.007	0.021
HAP	0.00	0.002	0.007
CH4	0.00	0.003	0.008
N2O	0.00	0.000	0.001
THC	0.04	0.180	0.541

LP Flare HAP

TOTAL SPECIATED POLLUTANT EMISSIONS SUMMARY[1]						Per Plant
		lb/MMscf	lb/MMBtu	lb/hr	tpy	tpy
HAP	Total	1.89E+00	1.74E-03	5.12E-04	2.242E-03	6.726E-03
Organic HAP Speciation						
	n-hexane	1.80E+00	1.66E-03	4.88E-04	2.14E-03	6.413E-03
	formaldehyde	7.50E-02	6.92E-05	2.03E-05	8.91E-05	2.672E-04
	toluene	3.40E-03	3.14E-06	9.22E-07	4.04E-06	1.211E-05
	benzene	2.10E-03	1.94E-06	5.69E-07	2.49E-06	7.481E-06
	dichlorobenzene	1.20E-03	1.11E-06	3.25E-07	1.43E-06	4.275E-06
	naphthalene	6.10E-04	5.63E-07	1.65E-07	7.24E-07	2.173E-06
POM Speciation						
	total POM	8.82E-05	8.14E-08	2.39E-08	1.05E-07	3.142E-07
	2-methylnaphthalene	2.40E-05	2.21E-08	6.51E-09	2.85E-08	8.550E-08
	phenanthrene	1.70E-05	1.57E-08	4.61E-09	2.02E-08	6.056E-08
	7,12-dimethylbenz(a)anthracene	1.60E-05	1.48E-08	4.34E-09	1.90E-08	5.700E-08
	pyrene	5.00E-06	4.61E-09	1.36E-09	5.94E-09	1.781E-08
	benzo(b,k)fluoranthene	3.60E-06	3.32E-09	9.76E-10	4.28E-09	1.283E-08
	fluoranthene	3.00E-06	2.77E-09	8.13E-10	3.56E-09	1.069E-08
	fluorene	2.80E-06	2.58E-09	7.59E-10	3.33E-09	9.975E-09
	anthracene	2.40E-06	2.21E-09	6.51E-10	2.85E-09	8.550E-09
	acenaphthene	1.80E-06	1.66E-09	4.88E-10	2.14E-09	6.413E-09
	acenaphthylene	1.80E-06	1.66E-09	4.88E-10	2.14E-09	6.413E-09
	benz(a)anthracene	1.80E-06	1.66E-09	4.88E-10	2.14E-09	6.413E-09
	chrysene	1.80E-06	1.66E-09	4.88E-10	2.14E-09	6.413E-09
	indeno(1,2,3-cd)pyrene	1.80E-06	1.66E-09	4.88E-10	2.14E-09	6.413E-09
	3-methylchloranthene	1.80E-06	1.66E-09	4.88E-10	2.14E-09	6.413E-09
	benzo(a)pyrene	1.20E-06	1.11E-09	3.25E-10	1.43E-09	4.275E-09
	benzo(g,h,i)perylene	1.20E-06	1.11E-09	3.25E-10	1.43E-09	4.275E-09
	dibenzo(a,h)anthracene	1.20E-06	1.11E-09	3.25E-10	1.43E-09	4.275E-09
Inorganic HAP Speciation						
	nickel	2.10E-03	1.94E-06	5.69E-07	2.49E-06	7.481E-06
	chromium	1.40E-03	1.29E-06	3.80E-07	1.66E-06	4.988E-06
	cadmium	1.10E-03	1.01E-06	2.98E-07	1.31E-06	3.919E-06
	manganese	3.80E-04	3.51E-07	1.03E-07	4.51E-07	1.354E-06
	mercury	2.60E-04	2.40E-07	7.05E-08	3.09E-07	9.263E-07
	arsenic	2.00E-04	1.85E-07	5.42E-08	2.38E-07	7.125E-07
	cobalt	8.40E-05	7.75E-08	2.28E-08	9.98E-08	2.993E-07
	selenium	2.40E-05	2.21E-08	6.51E-09	2.85E-08	8.550E-08
	beryllium	1.20E-05	1.11E-08	3.25E-09	1.43E-08	4.275E-08
	Total	1.89E+00	0.0017417	0.0005119	2.24E-03	6.726E-03

[1]**Emission factors in EPA AP-42, Section 1.5, "Natural Gas Combustor", July 1998**

Client: West Virginia Methanol
Project: Pleasants County Methanol Plant
Power Plant (RICE) Emissions Calculations

Parameter	Value	Units
Capacity	4,102	kW per engine
Number of Engines	7	#
Operation	8,760	hours per year
Gross Output	4,102	kW per engine
Heat Rate LHV	7,798	Btu/kWh
Heat Rate HHV	8,656	Btu/kWh
Fuel Consumption	533,109	Btu/min
Natural Gas Use HHV	35.51	MMBtu/h
Natural Gas Use LHV	31.99	MMBtu/h
Gas Heating Value, LHV	983.7	Btu/ft^3
Gas Heating Value, HHV	1,092	Btu/ft^3
Efficiency, LHV	43.76%	
Efficiency, HHV	39.42%	

Pollutant	Uncontrolled Emission Factor (g/bhphr)	Uncontrolled Emission Factor (g/kWhr)	Uncontrolled Emission Factor converted for limits (lb/MMBtu)	Emission Factor Source	Destruction and Removal Efficiency (DRE), [4]	Controlled Emission Factor (g/kWhr)	Controlled Emission Factor converted for limits (lb/MMBtu)	Max Uncontrolled per Engine (lb/hr)	Max Controlled per Engine (lb/hr)	Max Uncontrolled per Engine (ton/yr)	Max Controlled per Engine (ton/yr)	All Engines Total Max Uncontrolled (ton/yr)	All Engines Total Max Controlled (ton/yr)
Total PM	0.009	0.013	0.0032	Caterpillar [1]		0.0126056	0.0032	0.114	0.114	0.50	0.50	3.50	3.50
PM10	0.009	0.013	0.0032	Caterpillar [1]		0.0126056	0.0032	0.114	0.114	0.50	0.50	3.50	3.50
PM2.5	0.009	0.013	0.0032	Caterpillar [1]		0.0126056	0.0032	0.114	0.114	0.50	0.50	3.50	3.50
SO2	0.0016	0.0022	0.0006	AP-42 [2][3]		0.0022	0.0006	0.020	0.020	0.087	0.09	0.61	0.61
NOx	0.939	1.259	0.3208	Caterpillar [1]	86.0%	0.1763	0.0449	11.390	1.595	49.89	6.98	349.2	48.9
CO	1.281	1.718	0.4376	Caterpillar [1]	91.9%	0.1392	0.0354	15.536	1.258	68.05	5.51	476.3	38.6
VOC	0.158	0.212	0.0540	Miratech [4]	50.0%	0.1059	0.0270	1.916	0.958	8.39	4.20	58.7	29.4
CH4	3.660	4.91	1.25	AP-42 [2][3]		4.91	1.2500	44.381	44.381	194	194	1,361	1,361
N2O		0.01	0.0025			0.01	0.0025	0.090	0.090	0.40	0.40	2.8	2.8
Total HAP		0.4399	0.1120	[1][2][3][5]		0.06	0.01	3.978	0.513	17.42	2.25	121.97	15.72

Notes:

[1] Estimated values from Caterpillar and KW are shaft power.

[2] AP-42 Emission Factors from Chapter 3.2: Natural Gas-fired Reciprocating Engines, Table 3.2.-2 Uncontrolled Emission actors for 4-Stroke Lean-Burn Engines.

[3] AP-42 equivalent emission factor estimated from CAT design capacities for MMBtu/hr and kW/hr.

[4] Inlet VOC (removing ethane from CAT) and outlet by Miratech. DRE values from Miratech with margin added.

[5] Total uncontrolled HAP is the sum of all AP-42 equivalent emission factors and CAT provided emission factor for Formaldehyde.

RICE HAP Basis

Pollutant	Uncontrolled Emission Factor converted for Limits (g/kWhr)	Uncontrolled Emission Factor (lb/MMBtu)	Emission Factor Source	DRE [4]	Controlled Emission Factor converted for Limits (g/kWhr)	Controlled Emission Factor (lb/MMBtu)	Max Uncontrolled per Engine (lb/hr)	Max Controlled per Engine (lb/hr)	Max Uncontrolled per Engine (ton/yr)	Max Controlled per Engine (ton/yr)	All Engines Total Max Uncontrolled (ton/yr)	All Engines Total Max Controlled (ton/yr)
1,1,2,2-Tetrachloroethane	0.00016	0.00004	AP-42 [2][3]		0.00016	0.00004	0.0014	0.0014	0.0062	0.0062	0.044	0.044
1,1,2-Trichloroethane	0.00012	0.00003	AP-42 [2][3]		0.00012	0.00003	0.0011	0.0011	0.0049	0.0049	0.035	0.035
1,3-Butadiene	0.00105	0.00027	AP-42 [2][3]	70%	0.00031	0.00008	0.0095	0.0028	0.0415	0.0125	0.291	0.087
1,3-Dichloropropene	0.00010	0.00003	AP-42 [2][3]		0.00010	0.00003	0.0009	0.0009	0.0041	0.0041	0.029	0.029
2-Methylnaphthalene	0.00013	0.00003	AP-42 [2][3]		0.00013	0.00003	0.0012	0.0012	0.0052	0.0052	0.036	0.036
2,2,4-Trimethylpentane	0.00098	0.00025	AP-42 [2][3]		0.00098	0.00025	0.0089	0.0089	0.0389	0.0389	0.272	0.272
Acenaphthene	0.00000	0.00000	AP-42 [2][3]		0.00000	0.00000	0.0000	0.0000	0.0002	0.0002	0.001	0.001
Acenaphthylene	0.00002	0.00001	AP-42 [2][3]		0.00002	0.00001	0.0002	0.0002	0.0009	0.0009	0.006	0.006
Acetaldehyde	0.03388	0.00863	AP-42 [2][3]	70%	0.01016	0.00259	0.3064	0.0919	1.3421	0.4026	9.394	2.818
Acrolein	0.02018	0.00514	AP-42 [2][3]	75%	0.00505	0.00129	0.1825	0.0456	0.7993	0.1998	5.595	1.399
Benzene	0.00173	0.00044	AP-42 [2][3]	65%	0.00060	0.00015	0.0156	0.0055	0.0684	0.0239	0.479	0.168
Benzo(b)fluoranthene	0.00000	0.00000	AP-42 [2][3]		0.00000	0.00000	0.0000	0.0000	0.0000	0.0000	0.000	0.000
Benzo(e)pyrene	0.00000	0.00000	AP-42 [2][3]		0.00000	0.00000	0.0000	0.0000	0.0001	0.0001	0.000	0.000
Benzo(g,h,i)perylene	0.00000	0.00000	AP-42 [2][3]		0.00000	0.00000	0.0000	0.0000	0.0001	0.0001	0.000	0.000
Biphenyl	0.00083	0.00021	AP-42 [2][3]		0.00083	0.00021	0.0075	0.0075	0.0330	0.0330	0.231	0.231
CarbonTetrachloride	0.00014	0.00004	AP-42 [2][3]		0.00014	0.00004	0.0013	0.0013	0.0057	0.0057	0.040	0.040
Chlorobenzene	0.00012	0.00003	AP-42 [2][3]		0.00012	0.00003	0.0011	0.0011	0.0047	0.0047	0.033	0.033
Chloroform	0.00011	0.00003	AP-42 [2][3]		0.00011	0.00003	0.0010	0.0010	0.0044	0.0044	0.031	0.031
Chrysene	0.00000	0.00000	AP-42 [2][3]		0.00000	0.00000	0.0000	0.0000	0.0001	0.0001	0.001	0.001
Ethylbenzene	0.00016	0.00004	AP-42 [2][3]		0.00016	0.00004	0.0014	0.0014	0.0062	0.0062	0.043	0.043
EthyleneDibromide	0.00017	0.00004	AP-42 [2][3]		0.00017	0.00004	0.0016	0.0016	0.0069	0.0069	0.048	0.048
Fluoranthene	0.00000	0.00000	AP-42 [2][3]		0.00000	0.00000	0.0000	0.0000	0.0002	0.0002	0.001	0.001
Fluorene	0.00002	0.00001	AP-42 [2][3]		0.00002	0.00001	0.0002	0.0002	0.0009	0.0009	0.006	0.006
Formaldehyde	0.36270	0.09238	Caterpillar [1]	91.9%	0.02938	0.00748	3.2800	0.2657	14.3664	1.1637	100.565	8.146
Methanol	0.00982	0.00250	AP-42 [2][3]	65%	0.00344	0.00088	0.0888	0.0311	0.3888	0.1361	2.721	0.953
MethyleneChloride	0.00008	0.00002	AP-42 [2][3]		0.00008	0.00002	0.0007	0.0007	0.0031	0.0031	0.022	0.022
n-Hexane	0.00436	0.00111	AP-42 [2][3]	35%	0.00283	0.00072	0.0394	0.0256	0.1726	0.1122	1.208	0.785
Naphthalene	0.00029	0.00007	AP-42 [2][3]		0.00029	0.00007	0.0026	0.0026	0.0116	0.0116	0.081	0.081
PAH	0.00011	0.00003	AP-42 [2][3]		0.00011	0.00003	0.0010	0.0010	0.0042	0.0042	0.029	0.029
Phenanthrene	0.00004	0.00001	AP-42 [2][3]		0.00004	0.00001	0.0004	0.0004	0.0016	0.0016	0.011	0.011
Phenol	0.00009	0.00002	AP-42 [2][3]		0.00009	0.00002	0.0009	0.0009	0.0037	0.0037	0.026	0.026
Pyrene	0.00001	0.00000	AP-42 [2][3]		0.00001	0.00000	0.0000	0.0000	0.0002	0.0002	0.001	0.001
Styrene	0.00009	0.00002	AP-42 [2][3]		0.00009	0.00002	0.0008	0.0008	0.0037	0.0037	0.026	0.026
Tetrachloroethane	0.00001	0.00000	AP-42 [2][3]		0.00001	0.00000	0.0001	0.0001	0.0004	0.0004	0.003	0.003
Toluene	0.00160	0.00041	AP-42 [2][3]	55%	0.00072	0.00018	0.0145	0.0065	0.0634	0.0286	0.444	0.200
VinylChloride	0.00006	0.00001	AP-42 [2][3]		0.00006	0.00001	0.0005	0.0005	0.0023	0.0023	0.016	0.016
Xylene	0.00072	0.00018	AP-42 [2][3]	55%	0.00033	0.00008	0.0065	0.0029	0.0286	0.0129	0.200	0.090
Total	0.439904675	0.112046488			0.0566934	0.01444017	3.978	0.513	17.425	2.246	121.97	15.72

Notes:

[1] Estimated values from CAT

[2] AP-42 Emission Factors from Chapter 3.2: Natural Gas-fired Reciprocating Engines, Table 3.2.-2 Uncontrolled Emission Factors for 4-Stroke Lean-Burn Engines.

[3] AP-42 equivalent emission factor estimated from CAT design capacity for mmbtu/hr and kW/hr

[4] Destruction and Removal Efficiency (DRE) from Miratech with margin applied

EQUIPMENT LEAKS - VOC | EQUIPMENT LEAKS - CO | Leaks to LP Flare

Designation	Count Per Unit	Emission Factors (1) (kg/h/source)	TOC Emissions (lb/h)	Weighted Average VOC (2). %	VOC Emissions (lb/h)	Subpart Vva Control Effectiveness	VOC Average (lb/h)	VOC (TPY)	Max CO(2, 4),wt %	CO, lb/h
Valves										
Non VOC Valves	112	0.000131	0.032	2	0.0006	0	0.001	0.0028		
Non VOC - Contains CO Valves	125	0.000131	0.036	0	0.0000	0	0.000	0.0000	3	0.001
Light Liquid VOC Valves	183	0.000165	0.067	100	0.0666	0	0.067	0.2916		
Gas VOC - Contains CO Valves	40	0.000131	0.012	80	0.0092	0	0.009	0.0405	4.3	0.000
Gas VOC Valves	88	0.000131	0.025	100	0.0254	0	0.025	0.1113		
Total Valves	**548**									
Flanges & Connectors										
Non VOC Flanges & Connectors	193	0.000081	0.034	2	0.0007	0	0.001	0.0030		
Non VOC - Contains CO Flanges & Connectors	202	0.000081	0.036	0	0.0000	0	0.000	0.0000	3	0.001
Light Liquid VOC Flanges & Connectors	308	0.000081	0.055	100	0.0550	0	0.055	0.2409		
Gas VOC - Contains CO Flanges & Connectors	79	0.000081	0.014	80	0.0113	0	0.011	0.0494	4.3	0.001
Gas VOC Flanges & Connectors	150	0.000081	0.027	100	0.0268	0	0.027	0.1173		
Total Flanges & Connectors	**932**									
Sampling Connections										
Non VOC Sampling Connections	3	0.0015	0.010	2	0.0002	0	0.000	0.0009		
Non VOC - Contains CO Sampling Connections	0	0.0015	0.000	0	0.0000	0	0.000	0.0000		
Light Liquid VOC Sampling Connections	5	0.0015	0.017	100	0.0165	0	0.017	0.0724		
Gas VOC - Contains CO Sampling Connections	0	0.0015	0.000	80	0.0000	0	0.000	0.0000		
Gas VOC Sampling Connections	0	0.0015	0.000	100	0.0000	0	0.000	0.0000		
Total Sampling Connections	**8**									
Pump Seals										
Non VOC Pump Seals	0	0.0019	0.000	2	0.0000	0	0.000	0.0000		
Non VOC - Contains CO Pump Seals	0	0.0019	0.000	0	0.0000	0	0.000	0.0000		
Light Liquid VOC Pump Seals	6	0.0019	0.025	100	0.0251	0	0.025	0.1101		
Gas VOC - Contains CO Pump Seals	0	0.0019	0.000	80	0.0000	0	0.000	0.0000		
Gas VOC Pump Seals	0	0.0019	0.000	100	0.0000	0	0.000	0.0000		
Total Pump Seals	**0**									
Compressor Double Seals										
Non VOC Compressor Double Seals	2	0.089	0.392	2	0.0078	0.98	0.000	0.0007		
Non VOC - Contains CO Compressor Double Seals	4	0.089	0.785	0	0.0000	0.98	0.000	0.0000	3	0.000
Light Liquid VOC Compressor Double Seals	0	0.089	0.000	100	0.0000	0	0.000	0.0000		
Gas VOC - Contains CO Compressor Double Seals	0	0.089	0.000	80	0.0000	0	0.000	0.0000		0.000
Gas VOC Compressor Double Seals	0	0.089	0.000	100	0.0000	0	0.000	0.0000		
Total Compressor Double Seals	**6**									
PSV Routed to Flare										
Non VOC PSV Routed to Flare	5	0.0447	0.493	2	0.0099	0.98	0.000	0.0009		
Non VOC - Contains CO PSV Routed to Flare	9	0.0447	0.887	0	0.0000	0.98	0.000	0.0000	3	0.001
Light Liquid VOC PSV Routed to Flare	0	0.0447	0.000	100	0.0000	0.98	0.000	0.0000		
Gas VOC - Contains CO PSV Routed to Flare	3	0.0447	0.296	80	0.2365	0.98	0.005	0.0207	4.3	0.000
Gas VOC PSV Routed to Flare	1	0.0447	0.099	100	0.0985	0.98	0.002	0.0086		
Total PSV Routed to Flare	**18**									
PSV Routed to Atmosphere										
Non VOC PSV Routed to Atmosphere	0	0.0447	0.000	2	0.0000	0	0.000	0.0000		
Non VOC - Contains CO PSV Routed to Atmosphere	0	0.0447	0.000	0	0.0000	0	0.000	0.0000	3	0.000
Light Liquid VOC PSV Routed to Atmosphere	1	0.0447	0.099	100	0.0985	0	0.099	0.4316		
Gas VOC - Contains CO PSV Routed to Atmosphere	0	0.0447	0.000	80	0.0000	0	0.000	0.0000	4.3	0.000
Gas VOC PSV Routed to Atmosphere	3	0.0447	0.296	35	0.1035	0	0.103	0.4532		
Total PSV Routed to Atmosphere	**4**									
TOTAL PER UNIT								1.96		0.020 tpy
TOTAL PER PLANT								5.87		0.06 tpy

VOC+CO		Per Unit
lb/h	Btu/lb	MMBtu/h
0.007691	14500	0.00011153
0.023074	14100	0.00032535
Subtotal		0.00043688

VOC + CO		Per Unit
lb/h	Btu/lb	MMBtu/h
0.009658	14,500	0.00014003
0		
0.0000		
0.24424	10,055	0.00245593
0.096576	9,838	0.0009501
Subtotal		**0.00354607**

REFERENCE:

(1) TABLE 2-5, SOCMI SCREENING RANGES EMISSIONS FACTORS; Protocol for Equipment Leak Emission Estimates, EPA-453/R-95-017, Nov 1995.

(2) Based on facility stream balance by Haldor Topsoe.

(3) Based on component count data from Modular Plant Solutions.

(4) Based on Protocol for Equipment Leak Emission Estimates, EPA-453/R-95-017, Nov 1995.

EQUIPMENT LEAKS - HAP

Designation	Count Per Unit	Emission Factors (1) (kg/h/source)	TOC Emissions (lb/h)	Weighted Average HAP(2), %	HAP Emissions (lb/h)	Subpart Vva Control Effectiveness	HAP Average (lb/h)	HAP (TPY)
Valves								
Non VOC Valves	112	0.000131	0.032	0.5	0.0002	0	0.000	0.0007
Non VOC - Contains CO Valves	125	0.000131	0.036	0	0.0000	0	0.000	0.0000
Light Liquid VOC Valves	183	0.000165	0.067	100	0.0666	0	0.067	0.2916
Gas VOC - Contains CO Valves	40	0.000131	0.012	80	0.0092	0	0.009	0.0405
Gas VOC Valves	88	0.000131	0.025	100	0.0254	0	0.025	0.1113
Total Valves	**548**							
Flanges & Connectors								
Non VOC Flanges & Connectors	193	0.000081	0.034	0.5	0.0002	0	0.000	0.0008
Non VOC - Contains CO Flanges & Connectors	202	0.000081	0.036	0	0.0000	0	0.000	0.0000
Light Liquid VOC Flanges & Connectors	308	0.000081	0.055	100	0.0550	0	0.055	0.2409
Gas VOC - Contains CO Flanges & Connectors	79	0.000081	0.014	80	0.0113	0	0.011	0.0494
Gas VOC Flanges & Connectors	150	0.000081	0.027	100	0.0268	0	0.027	0.1173
Total Flanges & Connectors	**932**							
Sampling Connections								
Non VOC Sampling Connections	3	0.0015	0.010	0.5	0.0000	0	0.000	0.0002
Non VOC - Contains CO Sampling Connections	0	0.0015	0.000	0	0.0000	0	0.000	0.0000
Light Liquid VOC Sampling Connections	5	0.0015	0.017	100	0.0165	0	0.017	0.0724
Gas VOC - Contains CO Sampling Connections	0	0.0015	0.000	80	0.0000	0	0.000	0.0000
Gas VOC Sampling Connections	0	0.0015	0.000	100	0.0000	0	0.000	0.0000
Total Sampling Connections	**8**							
Pump Seals								
Non VOC Pump Seals	0	0.0019	0.000	0.5	0.0000	0	0.000	0.0000
Non VOC - Contains CO Pump Seals	0	0.0019	0.000	0	0.0000	0	0.000	0.0000
Light Liquid VOC Pump Seals	6	0.0019	0.025	100	0.0251	0	0.025	0.1101
Gas VOC - Contains CO Pump Seals	0	0.0019	0.000	80	0.0000	0	0.000	0.0000
Gas VOC Pump Seals	0	0.0019	0.000	100	0.0000	0	0.000	0.0000
Total Pump Seals	**0**							
Compressor Double Seals								
Non VOC Compressor Double Seals	2	0.089	0.392	0.5	0.0020	0.98	0.000	0.0002
Non VOC - Contains CO Compressor Double Seals	4	0.089	0.785	0	0.0000	0.98	0.000	0.0000
Light Liquid VOC Compressor Double Seals	0	0.089	0.000	100	0.0000	0	0.000	0.0000
Gas VOC - Contains CO Compressor Double Seals	0	0.089	0.000	80	0.0000	0	0.000	0.0000
Gas VOC Compressor Double Seals	0	0.089	0.000	100	0.0000	0	0.000	0.0000
Total Compressor Double Seals	**6**							
PSV Routed to Flare								
Non VOC PSV Routed to Flare	5	0.0447	0.493	0.5	0.0025	0.98	0.000	0.0002
Non VOC - Contains CO PSV Routed to Flare	9	0.0447	0.887	0	0.0000	0.98	0.000	0.0000
Light Liquid VOC PSV Routed to Flare	0	0.0447	0.000	100	0.0000	0.98	0.000	0.0000
Gas VOC - Contains CO PSV Routed to Flare	3	0.0447	0.296	80	0.2365	0.98	0.005	0.0207
Gas VOC PSV Routed to Flare	1	0.0447	0.099	100	0.0985	0.98	0.002	0.0086
Total PSV Routed to Flare	**18**							
PSV Routed to Atmosphere								
Non VOC PSV Routed to Atmosphere	0	0.0447	0.000	0.5	0.0000	0	0.000	0.0000
Non VOC - Contains CO PSV Routed to Atmosphere	0	0.0447	0.000	0	0.0000	0	0.000	0.0000
Light Liquid VOC PSV Routed to Atmosphere	1	0.0447	0.099	100	0.0985	0	0.099	0.4316
Gas VOC - Contains CO PSV Routed to Atmosphere	0	0.0447	0.000	80	0.0000	0	0.000	0.0000
Gas VOC PSV Routed to Atmosphere	3	0.0447	0.296	35	0.1035	0	0.103	0.4532
Total PSV Routed to Atmosphere	**4**							
TOTAL PER UNIT								1.95
TOTAL PER PLANT								5.85

REFERENCE:

(1) TABLE 2-5, SOCMI SCREENING RANGES EMISSIONS FACTORS; Protocol for Equipment Leak Emission Estimates, EPA-453/R-95-017, Nov 1995.

(2) Based on facility stream balance.

(3) Based on component count data from Modular Plant Solutions.

(4) Based on Protocol for Equipment Leak Emission Estimates, EPA-453/R-95-017, Nov 1995.

PAVED HAUL ROAD SPREADSHEET

Emission Year:	2022	
Average Weight of Empty Vehicles (tons):	13.5	Enter the average weight (in tons) of all unloaded vehicles traveling on the road.
Average Weight of Full Vehicles (tons):	40	Enter the average weight (in tons) of all loaded vehicles traveling on the road.
Percent of Miles that the Vehicles Travel While Empty:	50%	Enter the %. If vehicles travel the same distance empty and full, this number is should be entered as 50.
Average Vehicle Weight **(W)** (tons):	26.75	Average weight of vehicles based on the distance traveled on site.
Average Load Weight (tons):	26.5	Average weight of full vehicle minus average weight of empty vehicle.
Length of Haul Road (miles):	1	Enter the length of the haul road round trip.
Maximum Annual Throughput (tons)	362,109	Enter the maximum total annual throughput of the plant. Use permit limit if you have one.
Potential Annual One-Way Trips taken on road:	13,664	Maximum Potential Annual Throughput divided by Average Load Weight.
Actual Annual Throughput (tons)	362,109	Enter the total tons of throughput for year.
Actual Annual One-Way Trips taken on road:	13,664	Actual Annual Throughput divided by Average Load Weight.
Road Surface Silt Loading (g/m^2):	0.6	Enter 0.6 for public road, 120 for apshalt batching industrial road, 12 for concrete batching industrial road, 70 for sand & gravel processing industrial road, 8.2 for quarry industrial road. If facility has a permit with a silt loading limit, use that silt loading in the emissions calculations.
Days/Year with at Least 0.01 inches of Precipitation	157	See Map - Figure 1 for value. 100 may be entered as a default value.

SOURCE OF EMISSION FACTOR:	EQUATION	VALUES
The emission factor is taken from Equation 1 in AP-42, 13.2.1, Paved Roads.	**EF = [k x [s*L* ^0.91] x [W^1.02]]x((1- (p/1460)) lb/VMT**	k = constant = 0.0022 for PM-10 and 0.00054 for PM-2.5 from AP-42 Table 13.2.1-1 sL = road surface silt loading = 12 from AP-42 Table 13.2.1-3 W = Average Vehicle Weight (tons) p= The number of days that had at least 0.01 inches of precipitation.

EMISSIONS CALCULATIONS

Process	Pollutant	Emission Factor	Emission Factor Units	Source of Emission Factor	Potential Emissions (tons/year)	Actual Emissions (Tons/Yr)
Haul Road	PM	0.1762	lb/vmt	AP-42	1.20	1.20
Haul Road	PM-10	0.0352	lb/vmt	AP-42	0.24	0.24
Haul Road	PM-2.5	0.0086	lb/vmt	AP-42	0.06	0.06

FOR MINOR SOURCE EMISSIONS INVENTORY FORM INV-3 ONLY:

Process	Pollutant	Potential Emissions (lbs/hr)
Haul Road	PM	0.27
Haul Road	PM-10	0.05
Haul Road	PM-2.5	0.01

MONITORING, RECORDKEEPING, REPORTING, TESTING PLANS

WVM requests monitoring, recordkeeping, reporting and testing as stated in the Emissions Unit Data Sheets contained in Attachment L.

ATTACHMENT P: PUBLIC NOTICE

LEGAL ADVERTISEMENT

AIR QUALITY PERMIT NOTICE
Notice of Application

Notice is given that West Virginia Methanol, Inc., has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a Construction Permit for a new methanol production facility located at 9764 South Pleasants Highway near Belmont, in Pleasants County, WV. The latitude and longitude coordinates are: 39.33832 and -81.353048.

The applicant estimates the potential to discharge the Regulated Air Pollutants will be:
92.4 tons of nitrogen oxides per year;
88.7 tons of carbon monoxide per year;
46.9 tons of volatile organic compounds per year;
17.6 tons of particulate matter per year;
2.3 tons of sulfur dioxide per year; and
22.6 tons of hazardous air pollutants per year.

Startup of operations is planned to begin on or about the 15th day of March, 2023. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice. Written comments will also be received via email at DEPAirQualityPermitting@WV.gov.

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 41281, during normal business hours.

Dated this 23rd day of November, 2020.

By: West Virginia Methanol, Inc.
Lars Scott
Executive Vice President
1 Landy Lane
Cincinnati, OH 45215